

AD-A080 581

OGDEN AIR LOGISTICS CENTER HILL AFB UT PROPELLANT LAB--ETC F/6 21/9.2  
PROPELLANT SURVEILLANCE REPORT ANB-3066 PROPELLANT.(U)

NOV 79 E M DALABA

UNCLASSIFIED

MANCP-417(79)

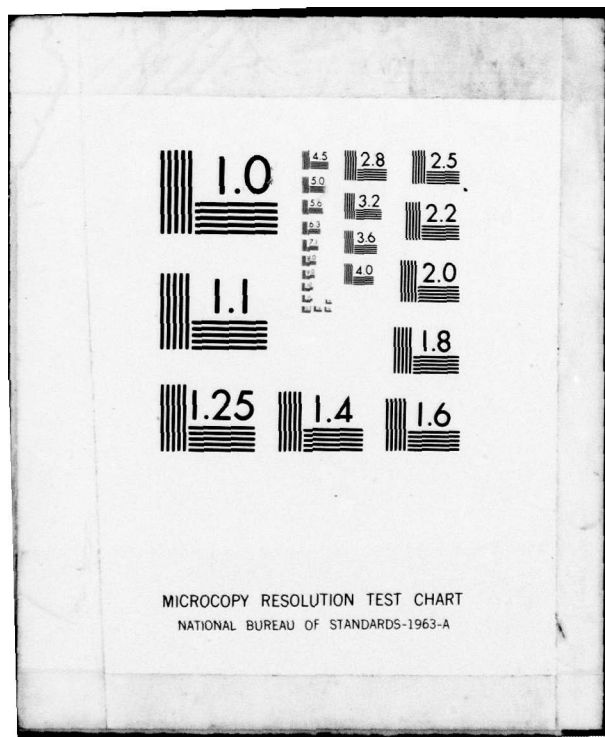
NL

1 OF 5

AD  
A080581







**LEVEL** *IT*

HEADQUARTERS  
OGDEN AIR LOGISTICS CENTER  
UNITED STATES AIR FORCE  
HILL AIR FORCE BASE, UTAH 84056

(2)

4

ADA080581

PROPELLANT  
SURVEILLANCE REPORT  
ANB-3066 PROPELLANT

DDC  
RECEIVED  
FEB 7 1980  
RECEIVED  
E

PROPELLANT LABORATORY SECTION

8

MANCP REPORT NR 417(79) ✓

November 1979

APPROVED FOR PUBLIC RELEASE, DISTRIBUTION UNLIMITED

80 2

6 010

DDC FILE COPY

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER MANCP Report Nr 417(79)	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) Propellant Surveillance Report ANB-3066 Propellant	5. TYPE OF REPORT & PERIOD COVERED Test Results - Semi-Annual Rept.	
7. AUTHOR(s) Elizabeth M. Dalaba	6. PERFORMING ORG. REPORT NUMBER	
9. PERFORMING ORGANIZATION NAME AND ADDRESS Propellant Lab Section Directorate of Maintenance OO-ALC Hill AFB, UT 84056	8. CONTRACT OR GRANT NUMBER(s)	
11. CONTROLLING OFFICE NAME AND ADDRESS Airmunitions Management Division Directorate of Materiel Management OO-ALC Hill AFB, UT 84056	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS	
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office) 12 396	12. REPORT DATE November 1979	
	13. NUMBER OF PAGES 389	
	15. SECURITY CLASS. (of this report) Unclassified	
	15a. DECLASSIFICATION/DOWNGRADING SCHEDULE	
16. DISTRIBUTION STATEMENT (of this Report)  Approved for public release, distribution unlimited		
17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)		
18. SUPPLEMENTARY NOTES		
19. KEY WORDS (Continue on reverse side if necessary and identify by block number)  Solid Propellant Minuteman		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number)  This report contains test results from LGM-30 F & G, Stage II and Stage III propellant. Data are shown in linear regression plots. The differences between polymers used in the propellant are shown in the composite plots for very low rate tensile, high rate tensile and stress relaxation data and is most evident in gradient stress relaxation modulus. Case liner bonds continue to show significant degradation although the rate of change has slowed.		

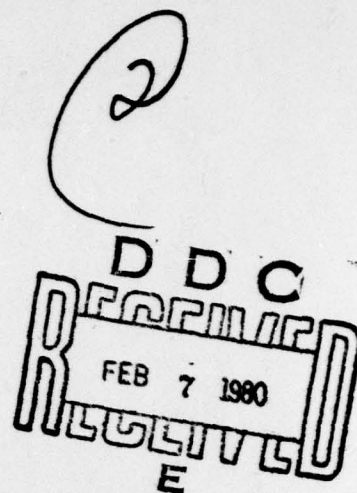
407387



PROPELLANT SURVEILLANCE REPORT  
ANB-3066 PROPELLANT

Author

*Elizabeth M. Dalaba*  
ELIZABETH M. DALABA, Chemist  
Component & Combustion Test Unit



Engineering & Statistical Review By

*Glenn S. Porter*  
GLENN S. PORTER, Project Engineer  
Service Engineering

*Gary W. Redmond*  
GARY W. REDMOND, Statistician  
Data Analysis Unit

Recommended Approval By

*Leonidas A. Brown*  
LEONIDAS A. BROWN, Chief  
Component & Combustion Test Unit

*Ronald F. Larsen*  
RONALD F. LARSEN, Chief  
Physical & Mechanical Test Unit

Approved By

*Don F. Woods*  
DON F. WOODS, Chief  
Propellant Laboratory Section

November 1979

Industrial Products & Ldg Gear Division  
Directorate of Maintenance  
Ogden Air Logistics Center  
United States Air Force  
Hill Air Force Base, Utah 84056

# ABSTRACT

This report contains test results from LGM-30 F and G, Stage II and Stage III propellant. Data are shown in linear regression plots.

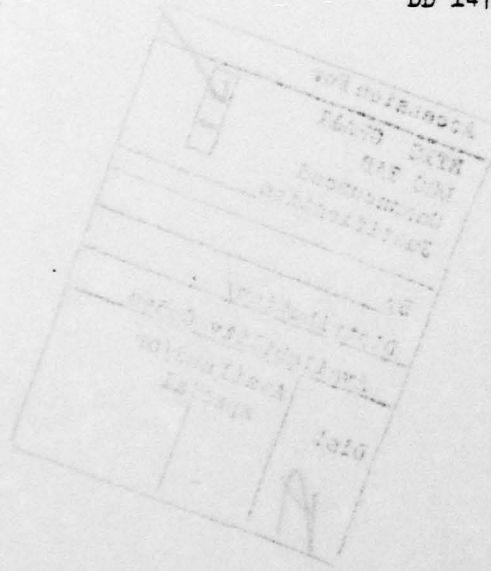
The differences between polymers used in the propellant are shown in the composite plots for very low rate tensile, high rate tensile and stress relaxation data and is most evident in gradient stress relaxation modulus.

Case liner bonds continue to show significant degradation although the rate of change has slowed.

Accession For	
NTIS	GRA&I
DDC	TAB
Unannounced	
Justification	
By	
Distribution/	
Availability Codes	
Dist	Avail and/or special
A	

# TABLE OF CONTENTS

<u>Section</u>		<u>Page</u>
	Abstract	ii
	List of Tables	iv
	List of Figures	v
	List of References	xvi
	Glossary of Terms and Abbreviations	xviii
I	Introduction	1-1
II	Test Program	2-1
III	Statistical Summary	3-1
IV	Very Low Rate Tensile	4-1
V	High Rate Tensile	5-1
VI	Stress Relaxation and Strain Dilatation	6-1
VII	Thermal Coefficient of Linear Expansion	7-1
VIII	Case Liner Bonds	8-1
IX	Tear Energy	9-1
	Distribution List	10-1
	DD 1473	10-2





# LIST OF TABLES

<u>Table Nr</u>		<u>Page</u>
1-1	Failure Criteria	1-2
2-1	Comparison of Standard Deviation	2-3
4-1	Very Low Rate Tensile, Significance of 't'	4-2
5-1	High Rate Triaxial Tensile, Significance of 't'	5-2
6-1	Stress Relaxation, Significance of 't'	6-3
6-2	Strain Dilatation, Significance of 't'	6-3
7-1	TCLE, Significance of 't'	7-3
8-1	Summary of Regression Analyses, Stress vs Time to Failure	8-4
9-1	Tear Energy, Significance of 't'	9-2



# LIST OF FIGURES

<u>Figure Nr</u>		<u>Page</u>
	Data Plots, Very Low Rate Tensile	
4-1	ANA 'G' Maximum Stress, Unlined Cartons	4-4
4-2	ANA 'G' Strain at Rupture, Unlined Cartons	4-5
4-3	ANA 'G' Modulus, Unlined Cartons	4-6
4-4	ANB 'G' Maximum Stress, Unlined Cartons	4-8
4-5	ANB 'G' Strain at Rupture, Unlined Cartons	4-9
4-6	ANB 'G' Modulus, Unlined Cartons	4-10
4-7	ANB 'G' Maximum Stress, Lined Cartons	4-12
4-8	ANB 'G' Strain at Rupture, Lined Cartons	4-13
4-9	ANB 'G' Modulus, Lined Cartons	4-14
4-10	ANB 'P' Maximum Stress, Unlined Cartons	4-16
4-11	ANB 'P' Strain at Rupture, Unlined Cartons	4-17
4-12	ANB 'P' Modulus, Unlined Cartons	4-18
4-13	ANB 'P' Maximum Stress, Lined Cartons	4-20
4-14	ANB 'P' Strain at Rupture, Lined Cartons	4-21
4-15	ANB 'P' Modulus, Lined Cartons	4-22
4-16	ANT 'P' Maximum Stress, Unlined Cartons	4-24
4-17	ANT 'P' Strain at Rupture, Unlined Cartons	4-25
4-18	ANT 'P' Modulus, Unlined Cartons	4-26
4-19	ANT 'P' Maximum Stress, Lined Cartons	4-28
4-20	ANT 'P' Strain at Rupture, Lined Cartons	4-29
4-21	ANT 'P' Modulus, Lined Cartons	4-30
4-22	ANA & ANB 'G' Maximum Stress, Unlined Cartons	4-32
4-23	ANA & ANB 'G' Strain at Rupture, Unlined Cartons	4-33
4-24	ANA & ANB 'G' Modulus, Unlined Cartons	4-34

# LIST OF FIGURES (cont)

<u>Figure Nr</u>		<u>Page</u>
4-25	ANB 'G' & 'P' Maximum Stress, Unlined Cartons	4-36
4-26	ANB 'G' & 'P' Strain at Rupture, Unlined Cartons	4-37
4-27	ANB 'G' & 'P' Modulus, Unlined Cartons	4-38
4-28	ANB 'G' & 'P' Maximum Stress, Lined Cartons	4-40
4-29	ANB 'G' & 'P' Strain at Rupture, Lined Cartons	4-41
4-30	ANB 'G' & 'P' Modulus, Lined Cartons	4-42
4-31	ANT & ANB 'P' Maximum Stress, Unlined Cartons	4-44
4-32	ANT & ANB 'P' Strain at Rupture, Unlined Cartons	4-45
4-33	ANT & ANB 'P' Modulus, Unlined Cartons	4-46
4-34	ANT & ANB 'P' Maximum Stress, Lined Cartons	4-48
4-35	ANT & ANB 'P' Strain at Rupture, Lined Cartons	4-49
4-36	ANT & ANB 'P' Modulus, Lined cartons	4-50

## Data Plots, High Rate Triaxial Tensile

5-1	ANA 'G' Maximum Stress, Unlined Cartons	5-4
5-2	ANA 'G' Strain at Rupture, Unlined Cartons	5-5
5-3	ANA 'G' Modulus, Unlined Cartons	5-6
5-4	ANB 'G' Maximum Stress, Unlined Cartons	5-8
5-5	ANB 'G' Strain at Rupture, Unlined Cartons	5-9
5-6	ANB 'G' Modulus, Unlined Cartons	5-10
5-7	ANB 'G' Maximum Stress, Lined Cartons	5-12
5-8	ANB 'G' Strain at Rupture, Lined Cartons	5-13
5-9	ANB 'G' Modulus, Lined Cartons	5-14
5-10	ANB 'P' Maximum Stress, Unlined Cartons	5-16
5-11	ANB 'P' Strain at Rupture, Unlined Cartons	5-17

# LIST OF FIGURES (cont)

<u>Figure Nr</u>		<u>Page</u>
5-12	ANB 'P' Modulus, Unlined Cartons	5-18
5-13	ANB 'P' Maximum Stress, Lined Cartons	5-20
5-14	ANB 'P' Strain at Rupture, Lined Cartons	5-21
5-15	ANB 'P' Modulus, Lined Cartons	5-22
5-16	ANT 'P' Maximum Stress, Unlined Cartons	5-24
5-17	ANT 'P' Strain at Rupture, Unlined Cartons	5-25
5-18	ANT 'P' Modulus, Unlined Cartons	5-26
5-19	ANT 'P' Maximum Stress, Lined Cartons	5-28
5-20	ANT 'P' Strain at Rupture, Lined Cartons	5-29
5-21	ANT 'P' Modulus, Lined Cartons	5-30
5-22	ANA 'G' & ANB 'G' Maximum Stress, Unlined Cartons	5-32
5-23	ANA 'G' & ANB 'G' Strain at Rupture, Unlined Cartons	5-33
5-24	ANA 'G' & ANB 'G' Modulus, Unlined Cartons	5-34
5-25	ANB 'G' & 'P' Maximum Stress, Unlined Cartons	5-36
5-26	ANB 'G' & 'P' Strain at Rupture, Unlined Cartons	5-37
5-27	ANB 'G' & 'P' Modulus, Unlined Cartons	5-39
5-28	ANB 'G' & 'P' Maximum Stress, Lined Cartons	5-41
5-29	ANB 'G' & 'P' Strain at Rupture, Lined Cartons	5-42
5-30	ANB 'G' & 'P' Modulus, Lined Cartons	5-43
5-31	ANT 'P' & ANB 'P' Maximum Stress, Unlined Cartons	5-45
5-32	ANT 'P' & ANB 'P' Strain at Rupture, Unlined Cartons	5-46
5-33	ANT 'P' & ANB 'P' Modulus, Unlined Cartons	5-47
5-34	ANT 'P' & ANB 'P' Maximum Stress, Lined Cartons	5-49
5-35	ANT 'P' & ANB 'P' Strain at Rupture, Lined Cartons	5-50
5-36	ANT 'P' & ANB 'P' Modulus, Lined Cartons	5-51



# LIST OF FIGURES (cont)

<u>Figure Nr</u>		<u>Page</u>
5-37	ANA 'G' Maximum Stress, Unlined Cartons	5-53
5-38	ANA 'G' Strain at Rupture, Unlined Cartons	5-54
5-39	ANA 'G' Modulus, Unlined Cartons	5-55
5-40	ANB 'G' Maximum Stress, Unlined Cartons	5-57
5-41	ANB 'G' Strain at Rupture, Unlined Cartons	5-58
5-42	ANB 'G' Modulus, Unlined Cartons	5-59
5-43	ANB 'G' Maximum Stress, Lined Cartons	5-61
5-44	ANB 'G' Strain at Rupture, Lined Cartons	5-62
5-45	ANB 'G' Modulus, Lined Cartons	5-63
5-46	ANB 'P' Maximum Stress, Unlined Cartons	5-65
5-47	ANB 'P' Strain at Rupture, Unlined Cartons	5-66
5-48	ANB 'P' Modulus, Unlined Cartons	5-67
5-49	ANB 'P' Maximum Stress, Lined Cartons	5-69
5-50	ANB 'P' Strain at Rupture, Lined Cartons	5-70
5-51	ANB 'P' Modulus, Lined Cartons	5-71
5-52	ANT 'P' Maximum Stress, Unlined Cartons	5-73
5-53	ANT 'P' Strain at Rupture, Unlined Cartons	5-74
5-54	ANT 'P' Modulus, Unlined Cartons	5-75
5-55	ANT 'P' Maximum Stress, Lined Cartons	5-77
5-56	ANT 'P' Strain at Rupture, Lined Cartons	5-78
5-57	ANT 'P' Modulus, Lined Cartons	5-79
Data Plots, Stress Relaxation Modulus, (polymer)		
6-1	ANA 'G' Unlined Cartons, 10 sec, 1% Strain	6-5
6-2	ANA 'G' Unlined Cartons, 1000 sec, 1% Strain	6-6

# LIST OF FIGURES (cont)

<u>Figure Nr</u>		<u>Page</u>
6-3	ANA 'G' Unlined Cartons, 10 sec, 3% Strain	6-8
6-4	ANA 'G' Unlined Cartons, 1000 sec, 3% Strain	6-9
6-5	ANB 'G' Lined Cartons, 10 sec, 1% Strain	6-11
6-6	ANB 'G' Lined Cartons, 1000 sec, 1% Strain	6-12
6-7	ANB 'G' Unlined Cartons, 10 sec, 3% Strain	6-14
6-8	ANB 'G', Unlined Cartons, 1000 sec, 3% Strain	6-15
6-9	ANB 'G' Lined Cartons, 10 sec, 1% Strain	6-17
6-10	ANB 'G' Lined Cartons, 1000 sec, 1% Strain	6-18
6-11	ANB 'G' Lined Cartons, 10 sec, 3% Strain	6-20
6-12	ANB 'G' Lined Cartons, 1000 sec, 1% Strain	6-21
6-13	ANB 'G' Unlined Cartons, 10 sec, 1% Strain	6-23
6-14	ANB 'G' Unlined Cartons, 1000 sec, 1% Strain	6-24
6-15	ANB 'P' Unlined Cartons, 10 sec, 3% Strain	6-26
6-16	ANB 'P' Unlined Cartons, 1000 sec, 3% Strain	6-27
6-17	ANB 'P' Lined Cartons, 10 sec, 1% Strain	6-29
6-18	ANB 'P' Lined Cartons, 1000 sec, 1% Strain	6-30
6-19	ANB 'P' Lined Cartons, 10 sec, 3% Strain	6-32
6-20	ANB 'P' Lined Cartons, 1000 sec, 3% Strain	6-33
6-21	ANT 'P' Unlined Cartons, 10 sec, 1% Strain	6-35
6-22	ANT 'P' Unlined Cartons, 1000 sec, 1% Strain	6-36
6-23	ANT 'P' Unlined Cartons, 10 sec, 3% Strain	6-38
6-24	ANT 'P' Unlined Cartons, 1000 sec, 3% Strain	6-39
6-25	ANT 'P' Lined Cartons, 10 sec, 1% Strain	6-41
6-26	ANT 'P' Lined Cartons, 1000 sec, 1% Strain	6-43

# LIST OF FIGURES (cont)

<u>Figure Nr</u>		<u>Page</u>
6-27	ANT 'P' Lined Cartons, 10 sec, 3% Strain	6-44
6-28	ANT "p" Lined Cartone, 1000 sec, 3% Strain	6-45
6-29	ANA & ANB 'G' Unlined Cartons, 10 sec, 1% Strain	6-47
6-30	ANA & ANB 'G' Unlined Cartons. 1000 sec, 1% Strain	6-48
6-31	ANB 'G' & 'P', Unlined Cartons, 10 sec, 1% Strain	6-50
6-32	ANB 'G' & 'P', Unlined Cartons, 1000 sec, 1% Strain	6-51
6-33	ANB 'G' & 'P'. Lined Cartons, 10 sec, 1% Strain	6-53
6-34	ANB 'G' & 'P' Lined Cartons, 1000 sec, 1% Strain	6-54
6-35	ANT & ANB 'P', Unlined Cartons, 10 sec, 1% Strain	6-56
6-36	ANT & ANB 'P' Unlined Cartons, 1000 sec, 1% Strain	6-57
6-37	ANT & ANB 'P' Lined Cartons, 10 sec, 1% Strain	6-59
6-38	ANT & ANB 'P' Lined Cartons, 1000 sec, 1% Strain	6-60
6-39	ANB & ANT Gradient Stress Relaxation Modulus, 6 sec	6-61
6-40	ANB & ANT Gradient Stress Relaxation Modulus, 60 sec	6-62
6-41	ANB & ANT Gradient Stress Relaxation Modulus, 1000 sec	6-63

## Data Plots, Strain Dilatation

6-42	ANA Poisson's Ratio, Unlined Cartons, 15% Strain	6-65
6-43	ANA Poisson's Ratio, Unlined Cartons, Maximum Strain	6-67
6-44	ANA Strain Dilatation at Maximum, Unlined Cartons	6-68
6-45	ANB 'G' Poisson's Ratio, Unlined Cartons, 15% Strain	6-70
6-46	ANB 'G' Poisson's Ratio, Unlined Cartons, Max Strain	6-72
6-47	ANB 'G' Strain Dilatation at Maximum, Unlined Cartons	6-73
6-48	ANB 'G' Poisson's Ratio, Lined Cartons, 15% Strain	6-75
6-49	ANB 'G' Poisson's Ratio, Lined Cartons, Maximum Strain	6-77



# LIST OF FIGURES (cont)

<u>Figure Nr</u>		<u>Page</u>
6-50	ANB 'G' Strain Dilatation at Maximum, Lined Cartons	6-78
6-51	ANB 'P' Poisson's Ratio, Unlined Cartons, 15% Strain	6-80
6-52	ANB 'P' Poisson's Ratio, Unlined Cartons, Max Strain	6-82
6-53	ANB 'P' Strain Dilatation at Maximum, Unlined Cartons	6-83
6-54	ANB 'P' Poisson's Ratio, Lined Cartons, 15% Strain	6-85
6-55	ANB 'P' Poisson's Ratio, Lined Cartons, Max Strain	6-87
6-56	ANB 'P' Strain Dilatation at Maximum, Lined Cartons	6-88
6-57	ANT Poisson's Ratio, Unlined Cartons, 15% Strain	6-90
6-58	ANT Poisson's Ratio, Unlined Cartons, Maximum Strain	6-92
6-59	ANT Strain Dilatation at Maximum, Unlined Cartons	6-93
6-60	ANT Poisson's Ratio, Lined Cartons, 15% Strain	6-95
6-61	ANT Poisson's Ratio, Lined Cartons, Maximum Strain	6-97
6-62	ANT Strain Dilatation at Maximum, Lined Cartons	6-98

## Data Plots, Thermal Coefficient of Linear Expansion (TCLE)

7-1	ANA 'G' Glass Point, Unlined Cartons	7-5
7-2	ANA 'G' Glass Point, Below Tg, Unlined Cartons	7-6
7-3	ANA 'G' Glass Point, Above Tg, Unlined Cartons	7-7
7-4	ANB 'G' Glass Point, Unlined Cartons	7-9
7-5	ANB 'G' Glass Point, Below Tg, Unlined Cartons	7-11
7-6	ANB 'G' Glass Point, Above Tg, Unlined Cartons	7-13
7-7	ANB 'G' Glass Point, Lined Cartons	7-14
7-8	ANB 'G' Glass Point, Below Tg, Lined Cartons	7-15
7-9	ANB 'G' Glass Point, Above Tg, Lined Cartons	7-16



# LIST OF FIGURES (cont)

<u>Figure Nr</u>		<u>Page</u>
7-10	ANB 'P' Glass Point, Unlined Cartons	7-18
7-11	ANB 'P' Glass Point, Below Tg, Unlined Cartons	7-20
7-12	ANB 'P' Glass Point, Above Tg, Unlined Cartons	7-22
7-13	ANB 'P' Glass Point, Lined Cartons	7-23
7-14	ANB 'P' Glass Point, Below Tg, Lined Cartons	7-24
7-15	ANB 'P' Glass Point, Above Tg, Lined Cartons	7-25
7-16	ANT 'P' Glass Point, Unlined Cartons	7-27
7-17	ANT 'P' Glass Point, Below Tg, Unlined Cartons	7-28
7-18	ANT 'P' Glass Point, Above Tg, Unlined Cartons	7-29
7-19	ANT 'P' Glass Point, Lined Cartons	7-31
7-20	ANT 'P' Glass Point, Below Tg, Lined Cartons	7-32
7-21	ANT 'P' Glass Point, Above Tg, Lined Cartons	7-34
7-22	TCLE Curve	7-35
7-23	TCLE Curve	7-36
7-24	TCLE Curve	7-37
7-25	TCLE Curve	7-38
	Data Plots, Constant Load Shear	
8-1	ANB Log Time vs Log Stress	8-5
8-2	ANT Log Time vs Log Stress	8-6
	Data Plots, Constant Load Tensile	
8-3	ANB Log Time vs Log Stress	8-7
8-4	ANT Log Time vs Log Stress	8-8
8-5	Constant Load Tensile, 20 to 30 psi Load	8-10
8-6	Constant Load Tensile, 40 to 50 psi Load	8-12
8-7	Constant Load Shear, Time to Break, 20 to 30 psi Load	8-14
8-8	Constant Load Shear, Time to Break, 40 to 50 psi Load	8-16

# LIST OF FIGURES (cont)

<u>Figure Nr</u>		<u>Page</u>
	Data Plots, MINI DPT	
8-9	ANB 'G', Maximum Stress	8-17
8-10	ANB 'G', Time to Failure	8-18
8-11	ANB 'P', Maximum Stress	8-20
8-12	ANB 'P', Time to Failure	8-21
	Data Plots, MINI DPT	
9-1	ANA 'G', Cohesive Energy, 40°F, Unlined Cartons	9-3
9-2	ANA 'G', Cohesive Energy, 77°F, Unlined Cartons	9-4
9-3	ANA 'G', Cohesive Energy, 120°F, Unlined Cartons	9-5
9-4	ANA 'G', Cohesive Energy, 160°F, Unlined Cartons	9-6
9-5	ANA 'G', Time To Tear, 40°F, Unlined Cartons	9-7
9-6	ANA 'G', Time to Tear, 77°F, Unlined Cartons	9-8
9-7	ANA 'G', Time to Tear, 120°F, Unlined Cartons	9-9
9-8	ANA 'G', Time to Tear, 160°F, Unlined Cartons	9-10
9-9	ANB 'G', Cohesive Energy, 40°F, Unlined Cartons	9-12
9-10	ANB 'G', Cohesive Energy, 77°F, Unlined Cartons	9-14
9-11	ANB 'G', Cohesive Energy, 120°F, Unlined Cartons	9-16
9-12	ANB 'G', Cohesive Energy, 160°F, Unlined Cartons	9-18
9-13	ANB 'G', Time to Tear, 40°F, Unlined Cartons	9-20
9-14	ANB 'G', Time to Tear, 77°F, Unlined Cartons	9-22
9-15	ANB 'G', Time to Tear, 120°F, Unlined Cartons	9-24
9-16	ANB 'G', Time to Tear, 160°F, Unlined Cartons	9-26
9-17	ANB 'G', Cohesive Energy, 40°F, Lined Cartons	9-27
9-18	ANB 'G', Cohesive Energy, 77°F, Lined Cartons	9-28

# LIST OF FIGURES (cont)

<u>Figure Nr</u>		<u>Page</u>
9-19	ANB 'G', Cohesive Energy, 120°F, Lined Cartons	9-29
9-20	ANB 'G', Cohesive Energy, 160°F, Lined Cartons	9-30
9-21	ANB 'G', Time to Tear, 40°F, Lined Cartons	9-31
9-22	ANB 'G', Time to Tear, 77°F, Lined Cartons	9-32
9-23	ANB 'G', Time to Tear, 120°F, Lined Cartons	9-33
9-24	ANB 'G', Time to Tear, 160°F, Lined Cartons	9-34
9-25	ANB 'P', Cohesive Energy, 40°F, Unlined Cartons	9-36
9-26	ANB 'P', Cohesive Energy, 77°F, Unlined Cartons	9-38
9-27	ANB 'P', Cohesive Energy, 120°F, Unlined Cartons	9-40
9-28	ANB 'P', Cohesive Energy, 160°F, Unlined Cartons	9-42
9-29	ANB 'P', Time to Tear, 40°F, Unlined Cartons	9-44
9-30	ANB 'P', Time to Tear, 77°F, Unlined Cartons	9-46
9-31	ANB 'P', Time to Tear, 120°F, Unlined Cartons	9-48
9-32	ANB 'P', Time to Tear, 160°F, Unlined Cartons	9-50
9-33	ANB 'P', Cohesive Energy, 40°F, Lined Cartons	9-51
9-34	ANB 'P', Cohesive Energy, 77°F, Lined Cartons	9-52
9-35	ANB 'P', Cohesive Energy, 120°F, Lined Cartons	9-53
9-36	ANB 'P', Cohesive Energy, 160°F, Lined Cartons	9-54
9-37	ANB 'P', Time to Tear, 40°F, Lined Cartons	9-55
9-38	ANB 'P', Time to Tear, 77°F, Lined Cartons	9-56
9-39	ANB 'P', Time to Tear, 120°F, Lined Cartons	9-57
9-40	ANB 'P', Time to Tear, 160°F, Lined Cartons	9-58
9-41	ANT 'P', Cohesive Energy, 40°F, Unlined Cartons	9-60
9-42	ANT 'P', Cohesive Energy, 77°F, Unlined Cartons	9-62
9-43	ANT 'P', Cohesive Energy, 120°F, Unlined Cartons	9-64



# LIST OF FIGURES (cont)

<u>Figure Nr</u>		<u>Page</u>
9-44	ANT 'P', Cohesive Energy, 160°F, Unlined Cartons	9-66
9-45	ANT 'P', Time to Tear, 40°F, Unlined Cartons	9-68
9-46	ANT 'P', Time to Tear, 77°F, Unlined Cartons	9-70
9-47	ANT 'P', Time to Tear, 120°F, Unlined Cartons	9-72
9-48	ANT 'P', Time to Tear, 160°F, Unlined Cartons	9-74
9-49	ANT 'P', Cohesive Energy, 40°F, Lined Cartons	9-75
9-50	ANT 'P', Cohesive Energy, 77°F, Lined Cartons	9-76
9-51	ANT 'P', Cohesive Energy, 120°F, Lined Cartons	9-77
9-52	ANT 'P', Cohesive Energy, 160°F, Lined Cartons	9-78
9-53	ANT 'P', Time to Tear, 40°F, Lined Cartons	9-79
9-54	ANT 'P', Time to Tear, 77°F, Lined Cartons	9-80
9-55	ANT 'P', Time to Tear, 120°F, Lined Cartons	9-81
9-56	ANB 'P', Time to Tear, 160°F, Lined Cartons	9-82

# REFERENCES

<u>Report Nr</u>	<u>Title</u>	<u>Date</u>
MAGCP 75 (67)	Zero Time Test Results LGM-30 Second Stage Wing VI Propellant	13 Jan 67
MAGCP 111 (67)	ATP Test Results LGM-30 Stage II Propellant Wing VI, Phase I	1 Dec 67
MAGCP 142 (68)	ATP Test Results LGM-30, Stage II Propellant, Wing VI, Phase I Series II	Nov 68
MAGCP 188 (70)	ATP Test Results LGM-30, Stage II Propellant, Wing VI, Phase I Series II	Jul 70
MAGCP 212 (71)	Propellant Surveillance Report LGM-30 Stage II (Wing 6 ANB-3066)	Jun 71
MAGCP 240 (72)	Propellant Surveillance Report LGM-30F Stage II ANB-3066	May 72
MAGCP 256 (72)	Propellant Surveillance Report Minuteman III, Stage III	Oct 72
MANCP 331 (75)	Propellant Surveillance Report Minuteman III, Stage III	Oct 75
Aerojet 0162-AS-6-1A	Ten Year Aging Program for Wing VI Minuteman Second Stage Motors and Components	Sep 67
Aerojet 0162-06-SAAS-7		Oct 71
0162-06-SAAS-8		Apr 71
0162-06-SAAS-9	Ten Year Aging and Storage Program Wing VI Minuteman Second Stage	Oct 71
0162-06-SAAS-10	Motors and Components Program Progress	Apr 72
0162-06-SAAS-11		Oct 72
0162-06-SAAS-12		Apr 73
0162-06-SAAS-13		Oct 74
0162-06-SAAS-14		Jul 75
0162-06-SAAS-15		Dec 75
0162-06-SAAS-16		Jul 76
0162-06-SAAS-17		Mar 77

# REFERENCES (cont)

<u>Report Nr</u>	<u>Title</u>	<u>Date</u>
Aerojet 0162-06-AS-F Appendix E	Final Report, Wing VI Minuteman Second Stage Motor Propellant Aging	Jan 74
MVS-1	Manufacturing Variables, Study of The Minuteman Stage II Motor	11 Jun 76
0162-06-SAAS-18	Ten Year Aging and Storage Program Wing VI Minuteman Second Stage	18 Aug 77
0162-06-SAAS-19	Motors and Components Program Progress	19 Feb 78
0162-06-SAAS-20		20 May 78



# GLOSSARY OF ABBREVIATIONS AND TERMS

Aging Trend	A change in properties of performance resulting from aging of material or component
ANA	Aerojet Propellant, Stage III (ANB 3066 Formulation)
ANT	Thiokol Propellant, Stage III (ANB 3066 Formulation)
ANB	Aerojet Propellant, Stage II (ANB 3066 Formulation)
ASPC	Aerojet Solid Propulsion Company
CSA	Cross Sectional Area
DB	Dogbone
Degradation	Gradual deterioration of properties or performance
E	Modulus (psi), defined as the slope of the line drawn tangent to the initial linear portion of the curve
EB	End Bonded
EGL	Effective Gage Length
$e_m$	Strain at Maximum Stress (in/in)
$e_r$	Strain at Rupture (in/in)
"F" ratio	The ratio of the variance accounted for by the regression function to the random unexplained variance. The regression function having the most significant "F" ratio is used for plotting data. The ratio is also used in detecting significant changes in random variation between succeeding time points.
JANNAF	Joint Army, Navy, NASA, Air Force Committee
MANCP	Propellant Laboratory at OOALC
OOALC	Ogden Air Logistics Center
Post Curing	Period up to 12 - 16 months after manufacture



# GLOSSARY OF ABBREVIATIONS AND TERMS (CONT.)

Regression	The general form of the regression equation is $Y = a + bx$
Regression Line	Line representing mean test values with respect to time
$S_b$	Standard error of estimate of the regression coefficient
$S_e$ or $S_{Y.X}$	Standard deviation of the data about the regression line
$S_m$	Maximum Stress (psi)
$S_r$	Stress at Rupture (psi)
Standard Deviation ( $S_y$ )	Square root of variance
Strain Rate	Crosshead speed divided by the EGL
Thiokol	Thiokol/Wasatch Division
"t" Test	A statistical test used to detect significant differences between a measured parameter and an expected value of the parameter (determines if regression slope differs from zero at the 95% confidence level)
Variance	The sum of squares of deviations of the test results from the mean of the series after division by one less than the total number of test results
3 Sigma Band	The area between the upper and lower 3 sigma limit. It can be expected that 99.73% of the inventory represented by the test samples would fall within this range assuming that the population is normally distributed.
90-90 Band	It can be stated with 90% confidence that 90% of the inventory represented by the test samples would fall within this range assuming that the population is normally distributed.

SECTION I  
INTRODUCTION

A. PURPOSE:

The purpose of testing ANB-3066 propellant, used in Minuteman II Stage II and Minuteman III Stage II and Stage III, is to monitor and evaluate aging effects on this propellant which will contribute to the operational motor serviceability prediction. Testing was performed according to General Test Directive GTD-2C, Amendment 1, and MMWRM Project M03677C/WNL91541.

B. BACKGROUND:

Service life testing of ANB-3066 carton propellant from Aerojet production began at Ogden ALC in 1966. When production for Minuteman III Stage III was transferred to Thiokol, the propellant samples from both Aerojet and Thiokol were tested. As lined cartons were produced, these were tested adding propellant liner bond specimens to the program. This report contains data from all these sources for propellant aged 13 to 147 months.

Although many of the parameters tested indicate significant aging trends, only case liner/insulation bond strengths appear to be approaching the alert limit. Significance tables for aging trend lines are given in the respective sections of the report.

Statistical analysis is shown in Section III.

TABLE 1-1

## FAILURE CRITERIA

<u>Component or Interface</u>	<u>Postulated Age-out Mode</u>	<u>Controlling Parameter</u>	<u>Alert Limit</u>
Propellant	1. Inner bore hoop strain failure		
	a. At second-stage ignition	Constant high strain rate tensile under pressure	11.5%
	b. During storage	Slow strain rate tensile with temperature change	4.9%
Propellant/insulation bond	1. Bond shear stress failure		
	a. During transportation and handling	Constant load shear	37.1 psi
	b. During storage	Constant load shear	15.4 psi
	c. During booster flight	Constant load shear	23.9 psi
	d. At second-stage ignition	High strain rate shear under pressure	12.9 psi
	2. Bond tensile stress failure		
	a. During transportation and handling	Constant load tensile (prop/prop and prop/liner)	65.4 psi
	b. During storage		23.1 psi
	c. During booster flight		49.9 psi



## SECTION II

### TEST PROGRAM

Cartons representing raw material combinations were subjected to a random selection process designed to test all material lots within a two year-four test periods interval. When propellant cartons have been aged one year, they are added to the test program.

Propellant cartons are identified by source of manufacture. Stage II and III propellant manufactured by Aerojet Solid Propulsion Company is identified as ANB and ANA respectively. Thiokol Company Stage III propellant is identified as ANT. All regressions use this nomenclature and the additional information as to the type of carton, lined or unlined. Symbols are used on multiple regressions to separate types. There were two suppliers for polymers for Stage II propellant, "G" polymer manufactured by General Tire and Rubber and "P" polymer from Phillips. In this report the two polymer types have been treated statistically.

Lined and unlined cartons of ANB have been combined in regression analysis for comparison purposes and cover the time span from 12 through 147 months.

The physical-mechanical tests which relate directly to stress analysis are limited. Very low rate tensile test data is related to storage conditions, and high rate rails tested under pressure relate to ignition. Stress relaxation modulus also relates to storage conditions. Thermal coefficient of linear expansion reflects some of the thermal stress to which the motor is exposed.

Low rate uniaxial tensile tests and hardness are routine tests for all propellant. These data were subjected to statistical analyses in the last report. Poisson's ratio and cohesive tear energy tests have been applied to only a portion of the cartons. Data from these tests has been analyzed for this report.

TABLE 2-1

## Comparison of Standard Deviation

Propellant Type	Very Low Rate Tensile		High Rate Tensile		Stress Relaxation	
	Sm	er	Sm	er	10 sec	1000 sec
ANA G Unlined	6.282	.0173	33.69	.0238	190.72	109.48
ANB G Unlined	7.910	.0193	38.45	.0299	187.27	117.19
ANB G Lined	5.910	.0193	27.97	.0132	102.53	58.24
ANB P Unlined	8.483	.0313	39.55	.0307	253.93	149.61
ANB P Lined	6.587	.0202	36.49	.0192	97.93	62.79
ANT P Unlined	8.932	.0210	33.99	.0297	165.14	101.95
ANT P Lined	6.363	.0144	36.49	.0235	133.24	82.54
ANA & ANG G Unlined	7.690	.0190	38.43	.0315	187.84	114.88
ANB G & P Unlined	8.323	.0256	44.42	.0319	239.01	141.92
ANB G & P Lined	6.306	.0199	33.92	.0180	99.55	60.67
ANB & ANT P Unlined	8.774	.0294	38.35	.0343	218.56	130.10
ANB & ANT P Lined	6.703	.0172	36.51	.0223	128.29	80.18



SECTION III  
STATISTICAL SUMMARY

Data analyses of all propellant tested by MANCP having the ANB 3066 formulation are contained in this report. ANB 3066 propellant is divided into three groups, each group pertaining to a specific rocket motor application. These propellant groups are further classified with regards to the manufacturer of the polymer contained in the propellant. The two manufacturers of ANB 3066 polymer are General Tire and Rubber ('G' type) and Phillips ('P' type). The three propellant groups are designated in this report as follows:

<u>Code</u>	<u>Polymer Type</u>	<u>Manufacturer and System Application</u>
ANA	G	Aerojet: MINUTEMAN III, Stage III
ANB	G and P	Aerojet: MINUTEMAN II, Stage II
ANT	P	Thiokol: MINUTEMAN III, Stage III

Propellant specimens for the ANA group were taken from unlined cartons and contains only "G" type polymer. Specimens for the ANB and ANT groups were taken from unlined cartons and also from cartons having a simulated case liner along one surface of the carton. Propellant from the ANB group contains both "G" and "P" type polymers. ANT propellant contains only "P" type polymer. Each propellant group is further sub-divided into propellant lots.

Test data from each propellant group have previously been analyzed to test for similarities between propellant lots within a given propellant group, as well as polymer type and carton type. The results of these analyses indicated statistically significant differences in the test data which preclude combining



data from different groups, lots, or cartons. (Ref MANCP Reports 374(77) and 398(78)).

The statistical approach used for this report was to characterize the aging trend for each test parameter using linear regression analyses. Regression techniques were used to study a particular test response as a function of propellant age. A simple linear regression model of the form,  $Y = a + b(X_1)$ , was used by assigning propellant age to the variable  $X_1$  in the model.

Separate regression analyses were performed for each propellant group and sub group; i.e., for a specific carton type within a given polymer and propellant group. Regression plots have been included where the slope of the regression line is significantly different from a line of zero slope. Tables providing a summary of the significance or non-significance of the regression analysis for each test parameter are included in an appropriate section of this report for each test conducted. Table 2-1 provides a summary of means and standard deviations for all tests on each propellant group and sub group.

Several regression analyses were performed on combined data from various carton types and propellant groups. Carton types and propellant groups are differentiated on the plots for these analyses by using different plotting symbols. Regression plots of these combined or "composite" data are included in this report solely for comparison with corresponding plots from the last test period. (Ref. MANCP Report 398(78)).

#### SECTION IV VERY LOW RATE TENSILE

This test uses a 1/2 inch thick (1.27cm) JANNAF dogbone. The specimens are tested at a crosshead speed of  $2 \times 10^{-4}$  in/min ( $8.5 \times 10^{-2}$  cm/sec) 77°F (25 °C) and ambient RH. Very low rate tensile testing is related to strain capability for storage at 60°F.

Lined cartons show a statistically significant decrease in strain at rupture. This holds true for both polymer types and for combinations. (Figures 4-8, 4-14, 4-20, 4-29 and 4-35). Maximum stress and modulus are statistically increased except for ANB G where the trend is not significant. (Figures 4-7, 4-13, 4-19, 4-28, 4-34 and 4-9; 4-15, 4-21, 4-30 and 4-36).

Maximum stress shows a statistically significant increase in fewer cases than in the last report. (Figures 4-1, 4-13, 4-16, 4-19, 4-28, 4-31 and 4-34). The trend is not significant for ANB G and ANB P unlined and ANB G lined and combinations of these. (Figures 4-4, 4-7, 4-10, 4-22, and 4-25).

As previously noted, strain at rupture decreases significantly in lined cartons. (Figures 4-8, 4-14, 4-20, 4-29, and 4-35). Unlined cartons show a statistically significant increase. (Figures 4-2, 4-5, 4-11, 4-17, 4-23, 4-26, and 4-32). Unlined cartons have a lower strain at rupture than lined cartons for both polymers (see Table 4-1).

Modulus is the least consistent of the parameters since unlined cartons show both increases and decreases which may be significant or not significant. Lined cartons of "P" polymer show a significant increase.

In summary, lined cartons show greater consistency than unlined cartons with lower standard deviations.

TABLE 4-1  
VERY LOW RATE TENSILE

Significance of Regression Slopes

SYSTEM	Sm	Fig	er	Fig	E	Fig
ANA G Unlined	Sig inc	4-1	Sig inc	4-2	NS	4-3
ANB G Unlined	NS	4-4	Sig inc	4-5	Sig dec	4-6
ANB G Lined	NS	4-7	Sig dec	4-8	NS	4-9
ANB P Unlined	NS	4-10	Sig inc	4-11	Sig dec	4-12
ANB P Lined	Sig inc	4-13	Sig dec	4-14	Sig inc	4-15
ANT P Unlined	Sig inc	4-16	Sig inc	4-17	Sig inc	4-18
ANT P Lined	Sig inc	4-19	Sig dec	4-20	Sig inc	4-21
ANA & ANB G Unlined	NS	4-22	Sig inc	4-23	Sig dec	4-24
ANB G & P Unlined	NS	4-25	Sig inc	4-26	Sig dec	4-27
ANB G & P Lined	Sig inc	4-28	Sig dec	4-29	Sig inc	4-30
ANB & ANT P Unlined	Sig inc	4-31	Sig inc	4-32	Sig dec	4-33
ANB & ANT P Lined	Sig inc	4-34	Sig dec	4-35	Sig inc	4-36

NS = Not significantly different from zero slope  
Sig Inc = Positive slope  
Sig Dec = Negative slope



\*\*\* SAMPLE SIZE SUMMARY \*\*\*

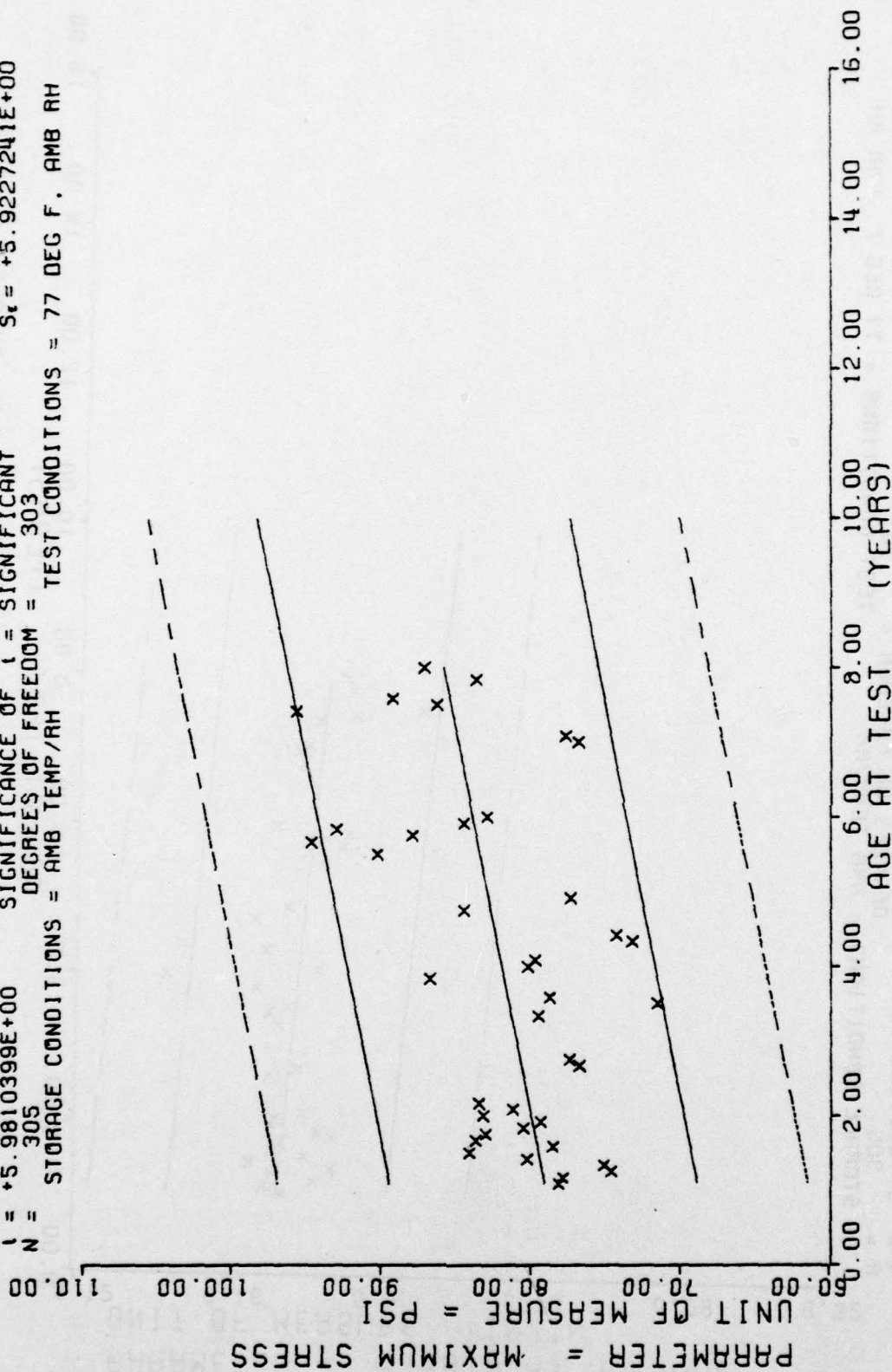
AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP
13	5	59	5
14	16	66	3
15	14	68	3
16	5	69	9
17	10	70	8
18	15	71	10
19	13	72	3
20	12	84	6
21	15	85	3
22	14	89	3
23	10	90	3
24	10	91	6
25	15	94	6
26	15	96	6
32	5		
33	5		
40	5		
42	5		
43	5		
46	5		
48	3		
49	7		
52	8		
53	11		
57	3		

4 1 3

ANB 3066 PROPELLANT(ANA), TENSILE MAX STRESS. .0002 IN/MIN, 77 DEG F. UNLND CTN

This sample size summary is applicable to figures 4-1, 4-2, and 4-3

$Y = ((+7.813334E+01) + (+8.0397934E-02) * X)$   
 $F = +3.5772839E+01$  SIGNIFICANCE OF F = SIGNIFICANT  $\sigma_f = +6.2522884E+00$   
 $R = +3.2495439E-01$  SIGNIFICANCE OF R = SIGNIFICANT  $S_e = +1.3442132E-02$   
 $I = +5.9810399E+00$  SIGNIFICANCE OF I = SIGNIFICANT  $S_t = +5.9227241E+00$   
 $N = 305$  DEGREES OF FREEDOM = 303  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 77 DEG F, AMB RH



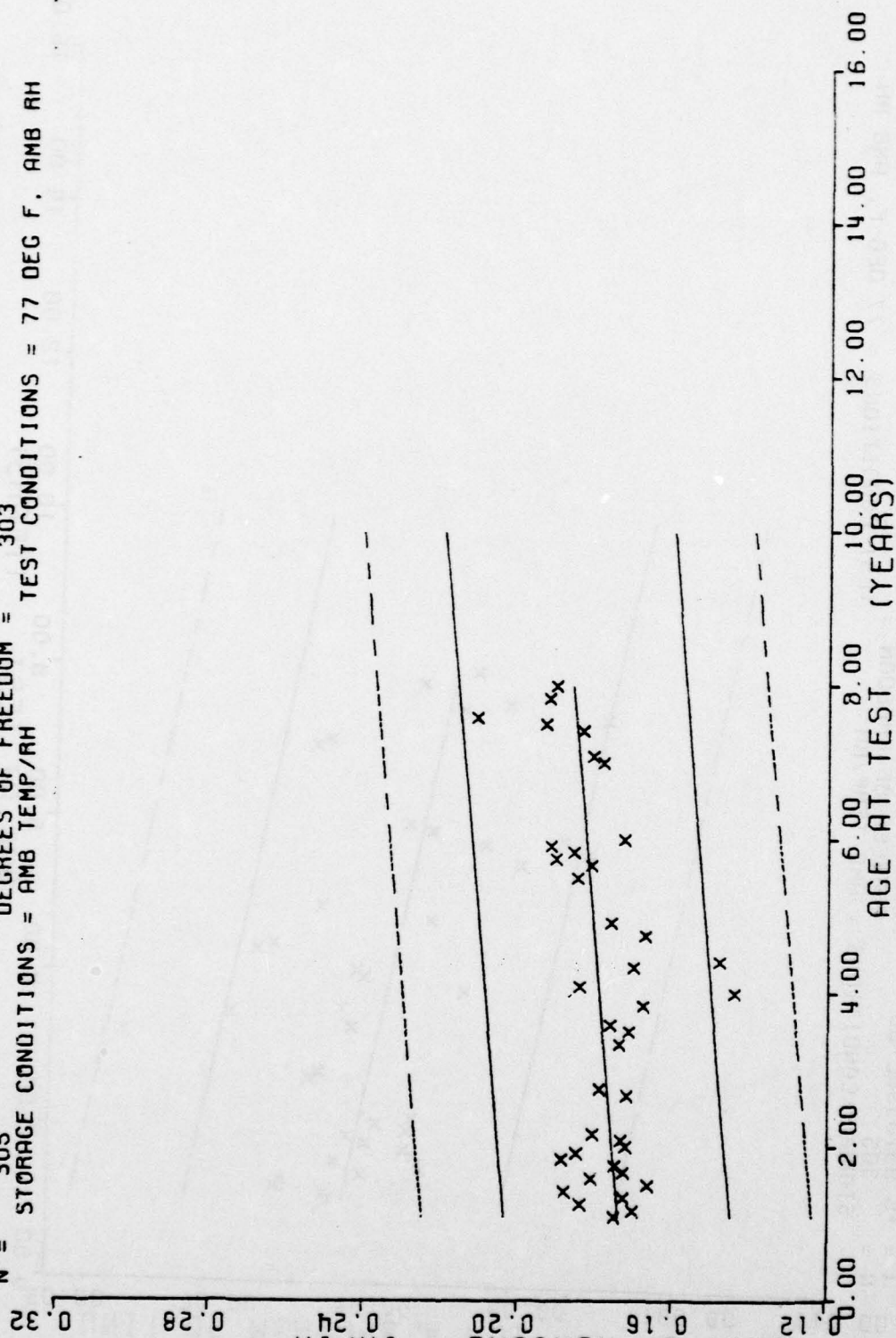
ANB 3066 PROPELLANT (ANA), TENSILE MAX STRESS, .0002 IN/MIN, 77 DEG F, UNLND CTN

Figure 4-1

PARAMETER = STRAIN AT RUPTURE

UNIT OF MEASURE = IN/IN

Y = (( +1.7245053E-01 ) + ( +1.4480587E-04 ) \* X)  
 F = +1.4159222E+01 SIGNIFICANCE OF F = SIGNIFICANT  
 R = +2.1129101E-01 SIGNIFICANCE OF R = SIGNIFICANT  
 t = +3.7628742E+00 SIGNIFICANCE OF t = SIGNIFICANT  
 N = 305 DEGREES OF FREEDOM = 303  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 77 DEG F, AMB RH

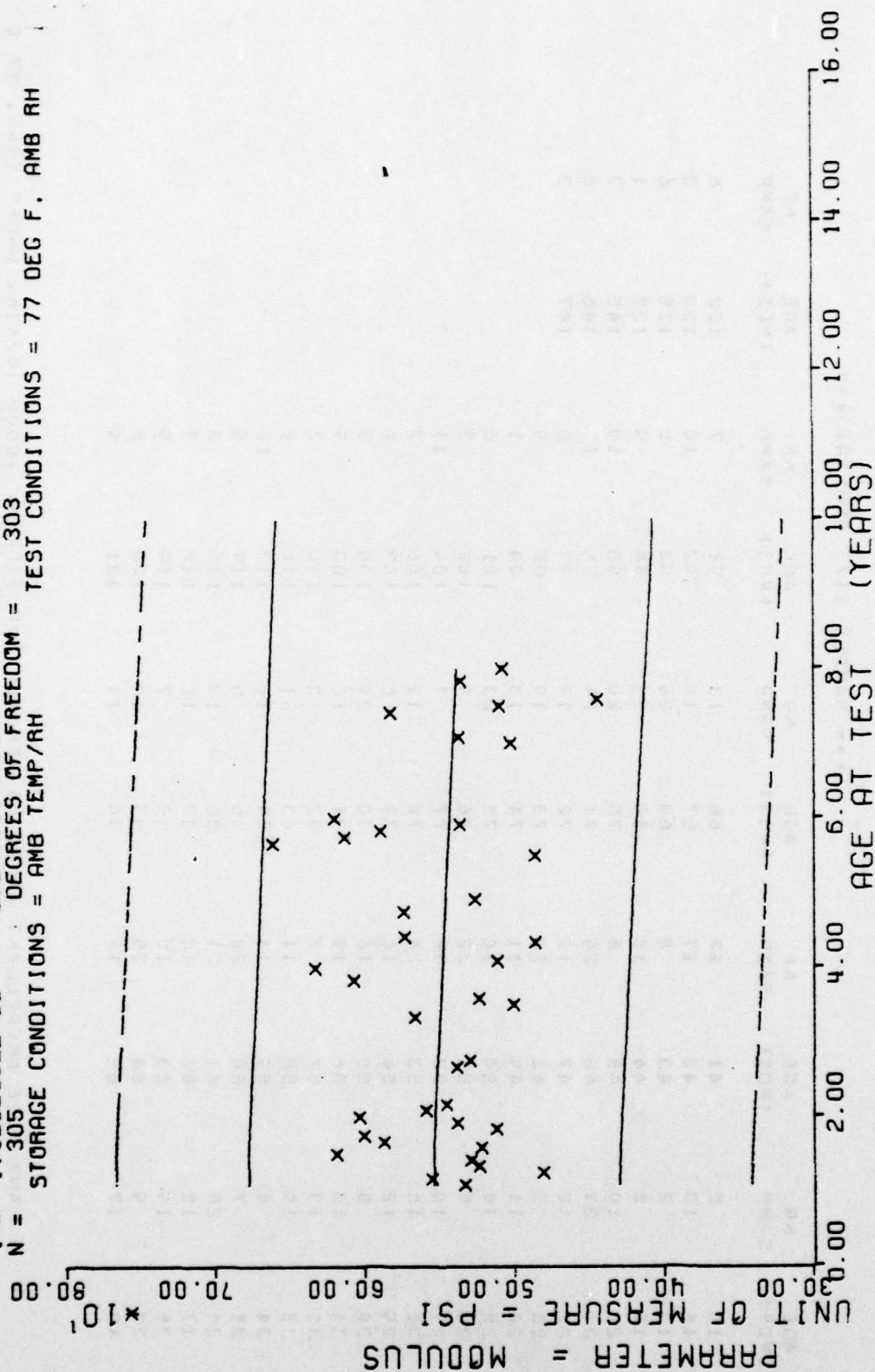


ANB 3066 PROPELLANT (ANA), TENSILE STN AT RUPT, .0002 IN/MIN, 77 DEG F, UNLND CT

Figure 4-2



$Y = ((+5.5771787E+02) + (-2.1322689E-01) * X)$   
 $F = +1.7590458E+00$  SIGNIFICANCE OF F = NOT SIGNIFICANT  $S_e = +7.0924816E+01$   
 $R = -7.5973175E-02$  SIGNIFICANCE OF R = NOT SIGNIFICANT  $S_e = +1.6076940E-01$   
 $t = +1.3262902E+00$  SIGNIFICANCE OF t = NOT SIGNIFICANT  $S_e = +7.0836437E+01$   
 $N = 305$  DEGREES OF FREEDOM = 303  
 STORAGE CONDITIONS = AMB TEMP/AH TEST CONDITIONS = 77 DEG F, AMB RH



ANB 3066 PROPELLANT (ANA), TENSILE MODULUS, 0.0002 IN/MIN, 77 DEG F, UNLND CTN

Figure 4-3

\*\*\* SAMPLE SIZE SUMMARY \*\*\*

AGE (MCS)	NR SAMP	AGE (MCS)	NR SAMP	AGE (MCS)	NR SAMP	AGE (MCS)	NR SAMP	AGE (MCS)	NR SAMP
15	5	41	22	66	13	91	7	122	6
16	13	42	17	67	18	92	10	123	3
17	2	43	8	68	24	93	5	125	6
19	5	44	10	69	25	94	9	137	1
20	10	45	8	70	20	95	19	145	3
21	23	46	29	71	24	96	12	146	3
22	18	47	12	72	17	97	6	147	3
23	5	48	20	73	19	98	9		
24	11	49	11	74	13	99	1		
25	16	50	10	75	23	101	8		
26	8	51	32	76	9	102	3		
27	10	52	36	77	7	104	11		
28	15	53	34	78	12	106	2		
29	12	54	16	79	5	107	2		
30	5	55	18	80	24	108	3		
31	13	56	19	81	16	109	9		
32	13	57	3	82	3	110	3		
33	19	58	11	83	21	111	6		
34	6	59	11	84	18	113	12		
35	7	60	20	85	6	114	9		
36	28	61	31	86	13	115	3		
37	15	62	18	87	10	118	7		
38	19	63	15	88	7	119	9		
39	9	64	29	89	18	120	8		
40	17	65	18	90	11	121	5		

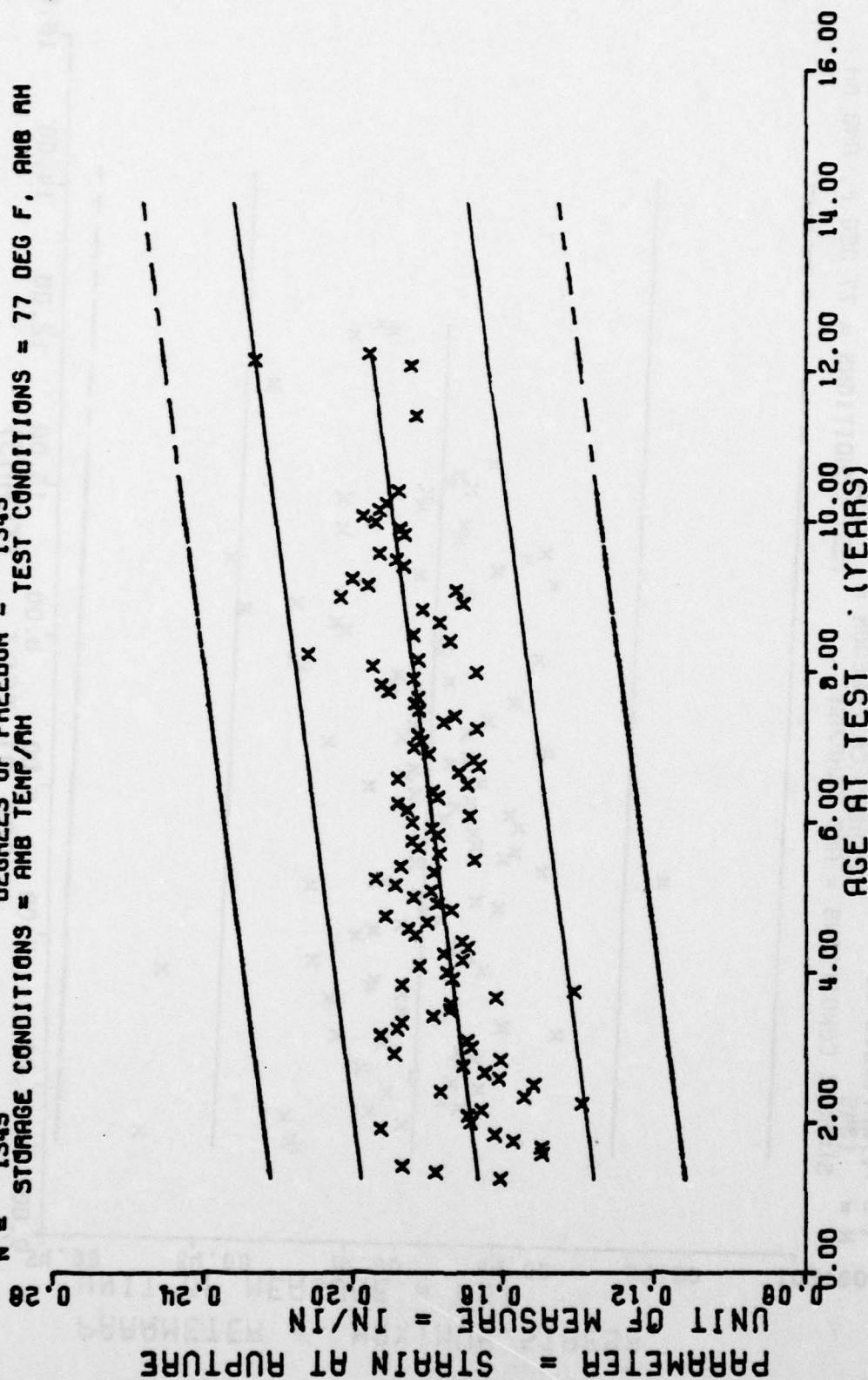
ANB 3066 PROPELLANT (ANB, G) TENSILE MAX STRESS, .0002 IN/MIN, UNLN CINS, 77 C

This sample size summary is applicable to figures 4-4, 4-5 and 4-6





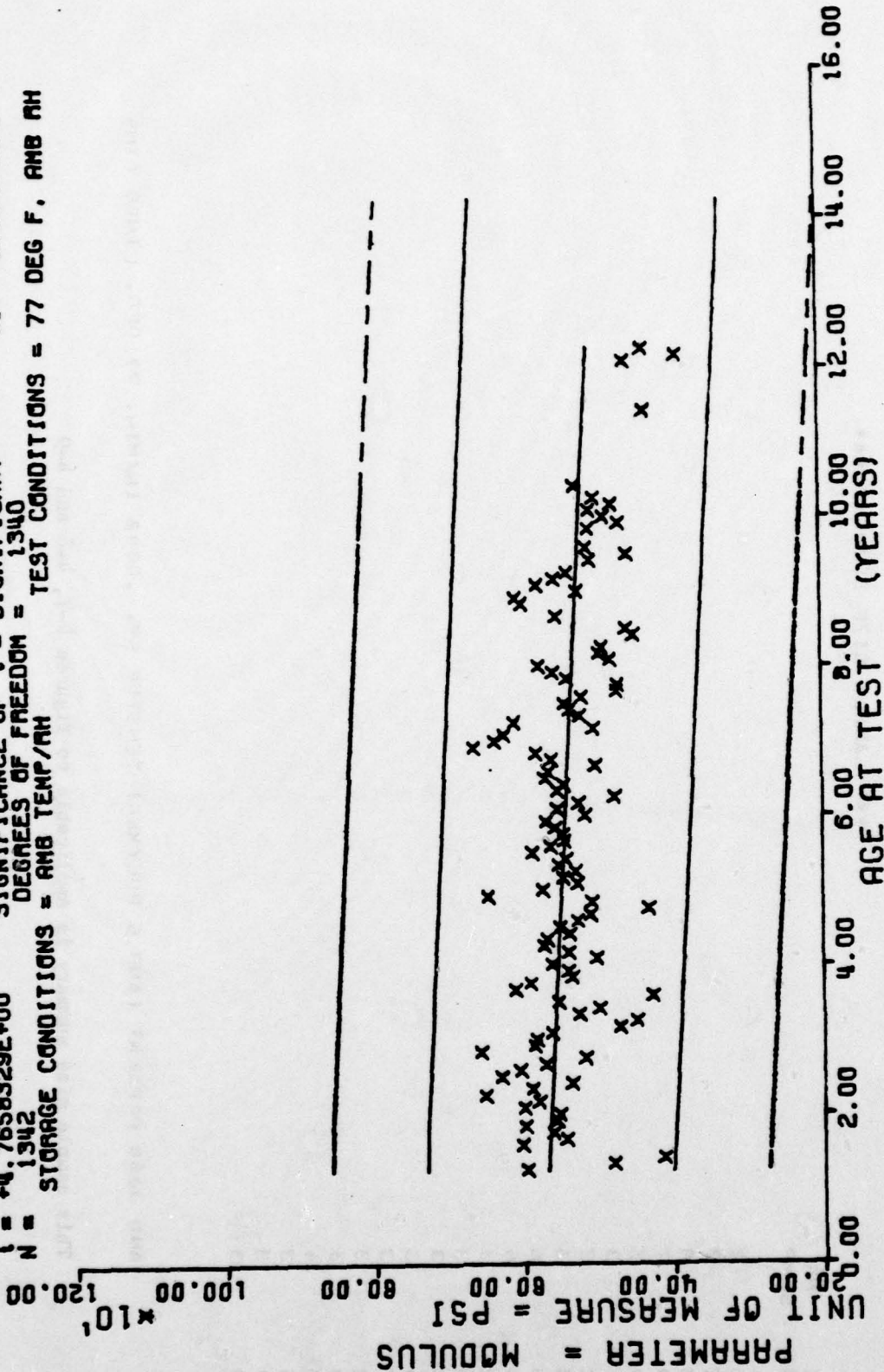
$Y = ((+1.6375042E-01) + (+2.1440441E-04) * X)$   
 $F = +1.3098284E+02$  SIGNIFICANCE OF F = SIGNIFICANT  $\sigma = +1.9342431E-02$   
 $A = +2.9810968E-01$  SIGNIFICANCE OF A = SIGNIFICANT  $S_0 = +1.8733112E-05$   
 $I = +1.1445210E+01$  SIGNIFICANCE OF I = SIGNIFICANT  $S_1 = +1.8469835E-02$   
 $N = 1345$  DEGREES OF FREEDOM = 1343  
 STORAGE CONDITIONS = AMB TEMP/AH TEST CONDITIONS = 77 DEG F, AMB AH



AMB 3066 PROPELLANT (AMB, G) TENSILE STN = AUP, .0002 IN/MIN, UNLND CTNS, 77 DG

Figure 4-5

$Y = ((+5.7426700E+02) + (-4.7100404E-01) * X)$   
 $F = +2.2713163E+01$  SIGNIFICANCE OF F = SIGNIFICANT  
 $R = -1.2910307E-01$  SIGNIFICANCE OF R = SIGNIFICANT  
 $t = +4.7658329E+00$  SIGNIFICANCE OF t = SIGNIFICANT  
 $N = 1342$  DEGREES OF FREEDOM = 1340  
 STORAGE CONDITIONS = AMB TEMP/AM TEST CONDITIONS = 77 DEG F, AMB RH



AMB 3066 PROPELLANT (AMB, G) TENSILE MODULUS, .0002 IN/MIN, UNLND CTNS, 77 DEG

Figure 4-6

\*\*\* SAMPLE SIZE SUMMARY \*\*\*

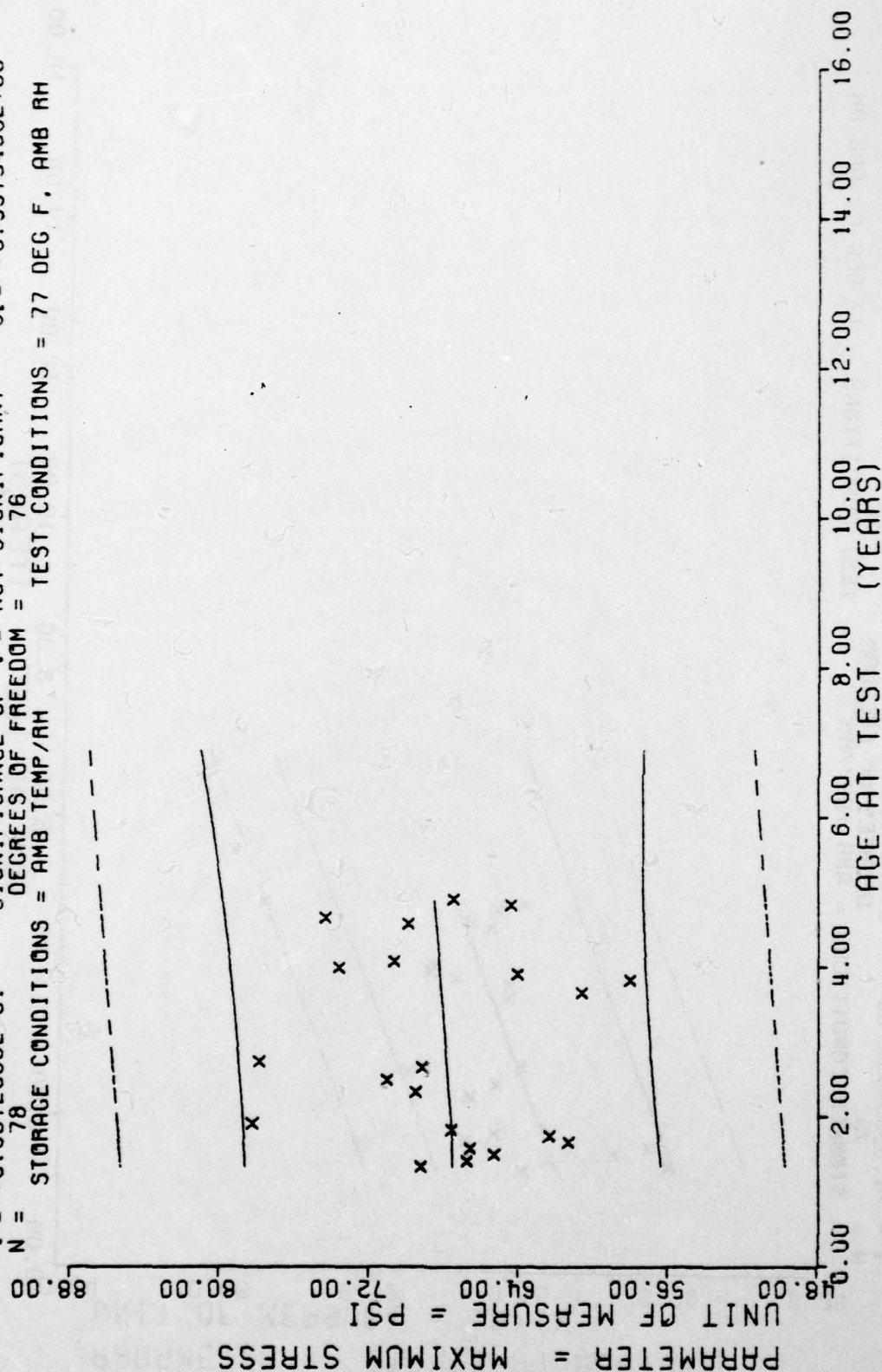
AGE (MOS)	NR SAMP
16	2
17	3
18	8
19	7
20	3
21	3
22	3
23	3
28	6
30	6
32	3
33	3
44	3
46	3
47	3
48	3
49	3
55	4
56	3
58	3
59	3

ANB 3066 PRPLLNT (ANB G POLYMER) TENSILE SM, .0002 IN/MIN, 77 DEG, LINF D CTNS

This sample size summary is applicable to figures 4-7, 4-8 and 4-9



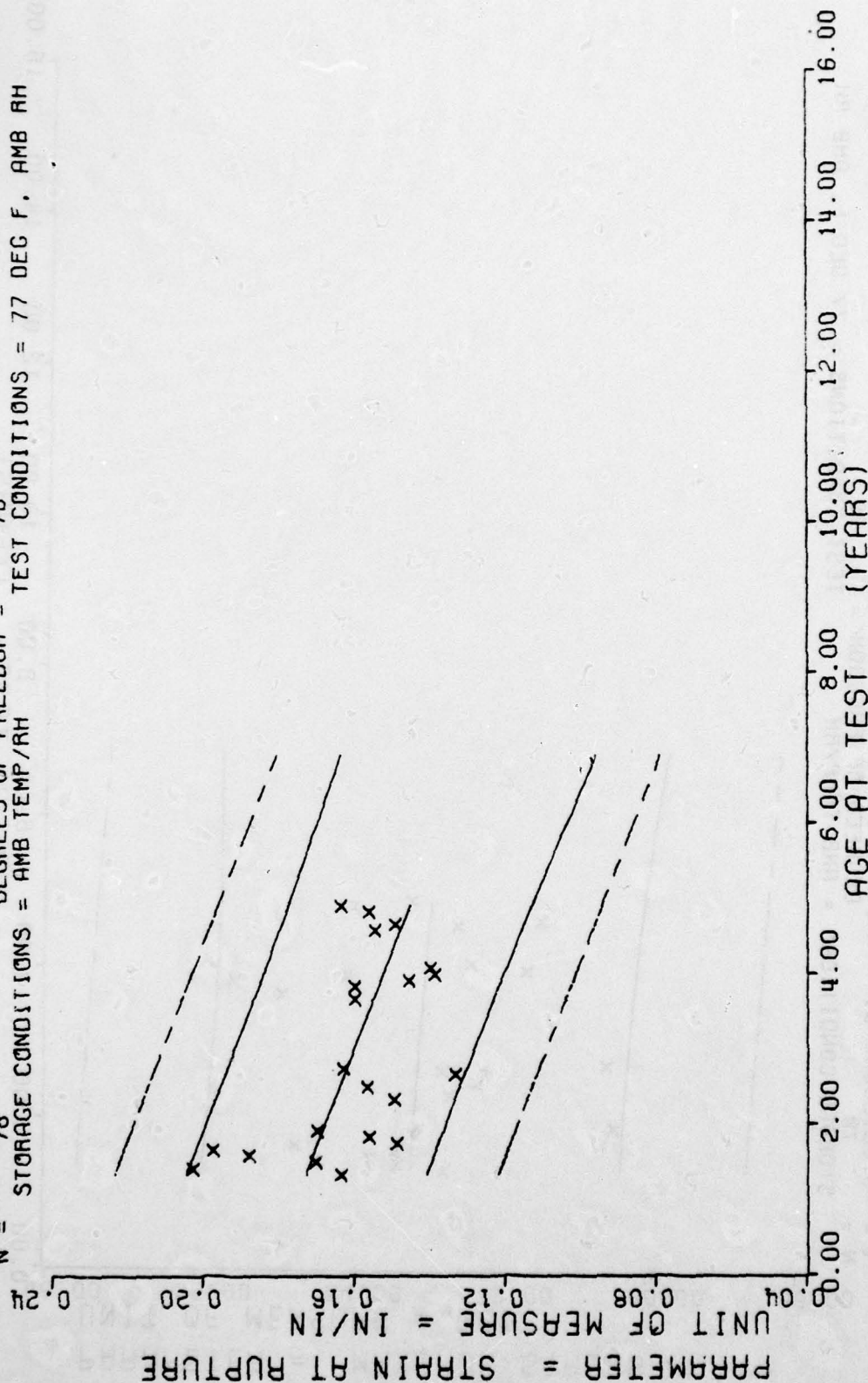
$F = +2.8806908E-01$  SIGNIFICANCE OF F = NOT SIGNIFICANT  $\sigma_r = +5.9104314E+00$   
 $R = +6.1449735E-02$  SIGNIFICANCE OF R = NOT SIGNIFICANT  $S_0 = +4.6026511E-02$   
 $L = +5.3672068E-01$  SIGNIFICANCE OF L = NOT SIGNIFICANT  $S_1 = +5.9379459E+00$   
 $N = 78$  DEGREES OF FREEDOM = 76  
 STORAGE CONDITIONS = AMB TEMP/AH TEST CONDITIONS = 77 DEG F, AMB RH



AMB 3066 PAPPLNT (AMB C POLYMER) TENSILE SM, .0002 IN/MIN, 77 DEG, LINED CINS

Figure 4-7

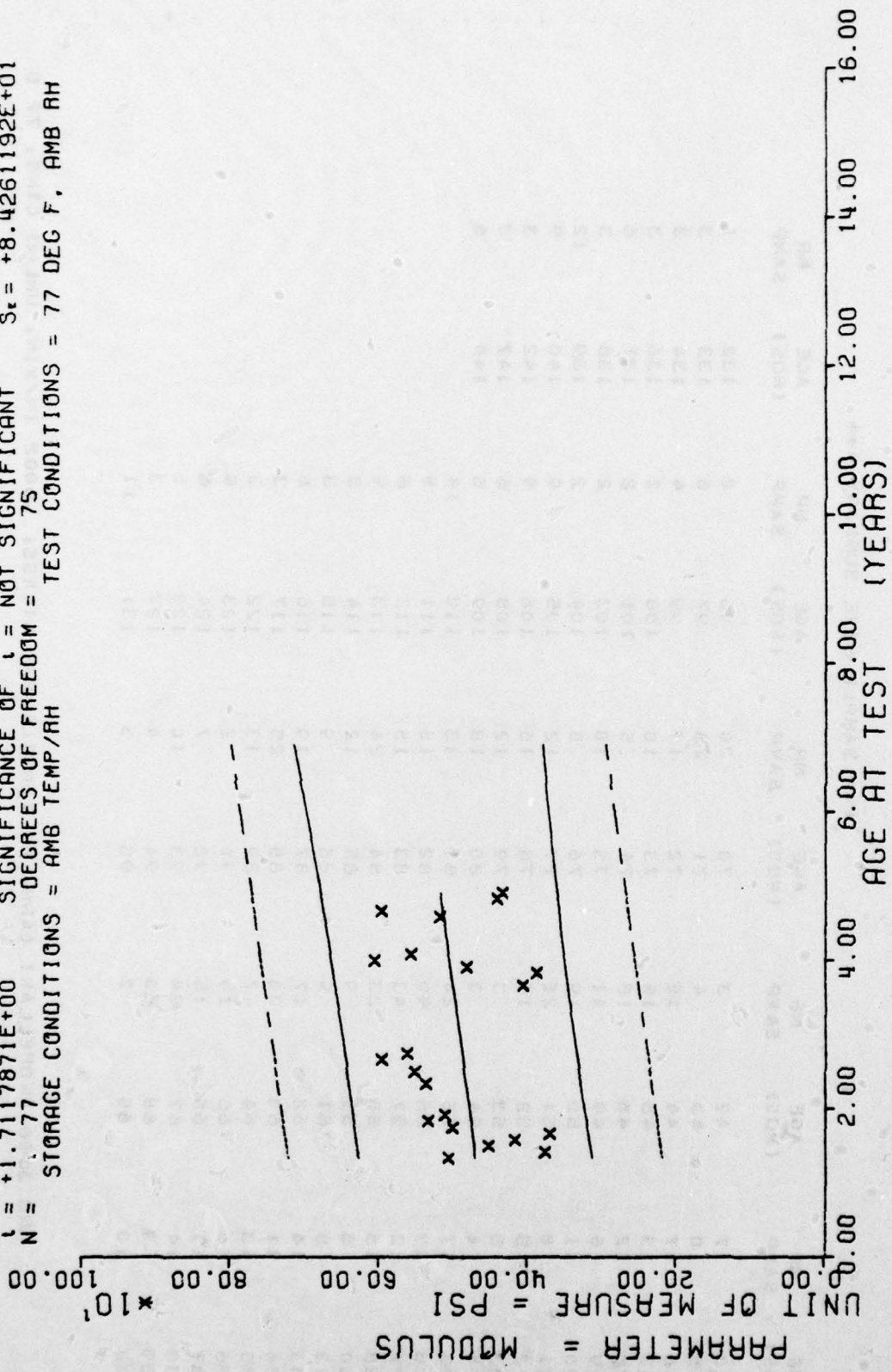
$Y = ((+1.8315396E-01) + (-6.4631420E-04) \times X)$   
 $F = +2.4387278E+01$  SIGNIFICANCE OF F = SIGNIFICANT  $G_1 = +1.9278986E-02$   
 $R = -4.9288128E-01$  SIGNIFICANCE OF R = SIGNIFICANT  $S_0 = +1.3087660E-04$   
 $t = +4.9383477E+00$  SIGNIFICANCE OF t = SIGNIFICANT  $S_t = +1.6884578E-02$   
 $N = 78$  DEGREES OF FREEDOM = 76  
 STORAGE CONDITIONS = AMB TEMP/AH TEST CONDITIONS = 77 DEG F, AMB RH



ANB 3066 PROPLANT (ANB G POLYMER) TENSILE ER. .0002 IN/MIN, 77 DEG. LINED CTNS

Figure 4-8

$Y = ((+4.5179134E+02) + (+1.1343018E+00) \times X)$   
 $F = +2.9302151E+00$  SIGNIFICANCE OF F = NOT SIGNIFICANT  $G_1 = +8.5324498E+01$   
 $R = +1.9390848E-01$  SIGNIFICANCE OF R = NOT SIGNIFICANT  $S_0 = +6.6264186E-01$   
 $U = +1.7117871E+00$  SIGNIFICANCE OF U = NOT SIGNIFICANT  $S_1 = +8.4261192E+01$   
 $N = 77$  DEGREES OF FREEDOM = 75  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 77 DEG F, AMB RH



AMB 3066 PROPLNT (AMB C POLYMER) TENSILE MODULUS, .0002 IN/MIN, 77 DEG. LINED

Figure 4-9



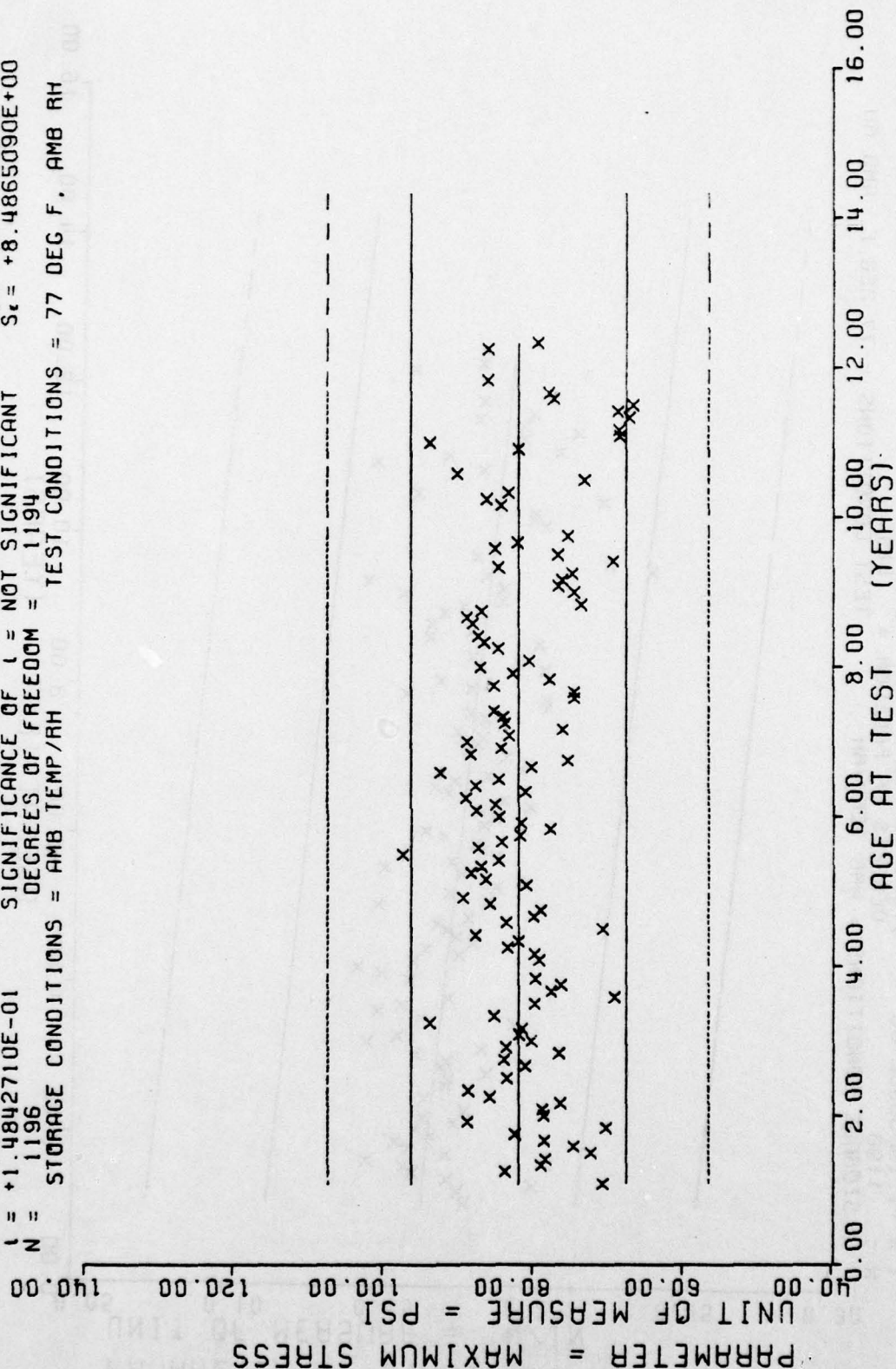
\*\*\* SAMPLE SIZE SUMMARY \*\*\*

AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP
13	7	42	3	70	20	96	8	132	1
15	10	43	4	71	23	97	6	133	3
16	17	44	15	72	17	99	4	134	3
17	13	45	15	73	10	100	2	136	3
18	12	46	15	74	5	101	2	137	6
19	6	49	11	75	10	103	2	138	3
20	11	50	19	76	8	104	2	139	12
21	8	51	26	77	12	105	9	140	9
22	5	52	14	78	16	106	9	142	3
23	5	53	3	79	12	108	6	147	3
24	4	54	3	80	18	109	5	148	6
25	17	55	24	81	13	110	14		
26	19	56	40	82	15	111	5		
27	12	57	43	83	15	112	6		
28	15	58	23	84	24	113	9		
30	5	59	9	85	12	114	3		
32	8	61	9	86	9	115	3		
33	14	62	17	87	19	116	6		
34	11	63	30	88	25	117	3		
35	13	64	7	89	13	122	3		
36	16	65	10	91	2	123	9		
37	11	66	15	92	7	124	6		
38	14	67	28	93	10	126	6		
39	3	68	20	94	4	127	3		
40	10	69	7	95	5	131	11		

ANB 3066 PROPELLANT (ANB, P) TENSILE MAX STRESS, .0002 IN/MIN, UNLND CTNS, 77 D

This sample size summary is applicable to figures 4-10, 4-11 and 4-12

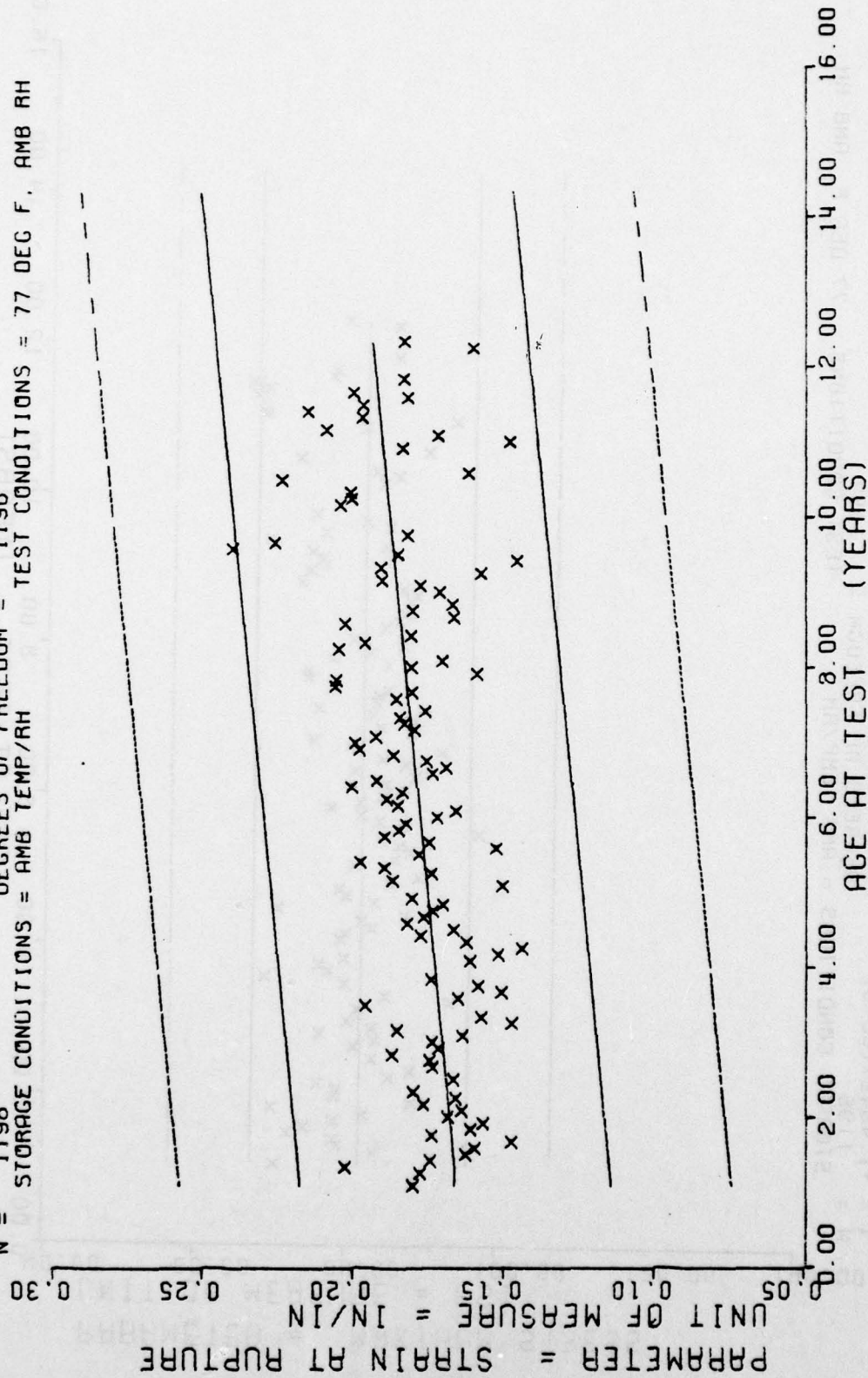
$Y = ((+8.2048654E+01) + (-1.1654875E-03) \times X)$   
 $F = +2.2030606E-02$  SIGNIFICANCE OF F = NOT SIGNIFICANT  $\sigma_r = +8.4830357E+00$   
 $R = -4.2954340E-03$  SIGNIFICANCE OF R = NOT SIGNIFICANT  $S_e = +7.8522551E-03$   
 $t = +1.4842710E-01$  SIGNIFICANCE OF t = NOT SIGNIFICANT  $S_t = +8.4865090E+00$   
 $N = 1196$  DEGREES OF FREEDOM = 1194  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 77 DEG F, AMB RH



ANB 3066 PROPELLANT (ANB, P) TENSILE MAX STRESS, .0002 IN/MIN, UNLND CTNS, 77 D

Figure 4-10

$Y = ((+1.6344054E-01) + (+2.0382723E-04) \times X)$   
 $F = +5.1696241E+01$  SIGNIFICANCE OF F = SIGNIFICANT  $G_r = +3.1284403E-02$   
 $R = +2.0355184E-01$  SIGNIFICANCE OF R = SIGNIFICANT  $S_r = +2.8348672E-05$   
 $t = +7.1900098E+00$  SIGNIFICANCE OF t = SIGNIFICANT  $S_r = +3.0642240E-02$   
 $N = 1198$  DEGREES OF FREEDOM = 1196  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 77 DEG F, AMB RH

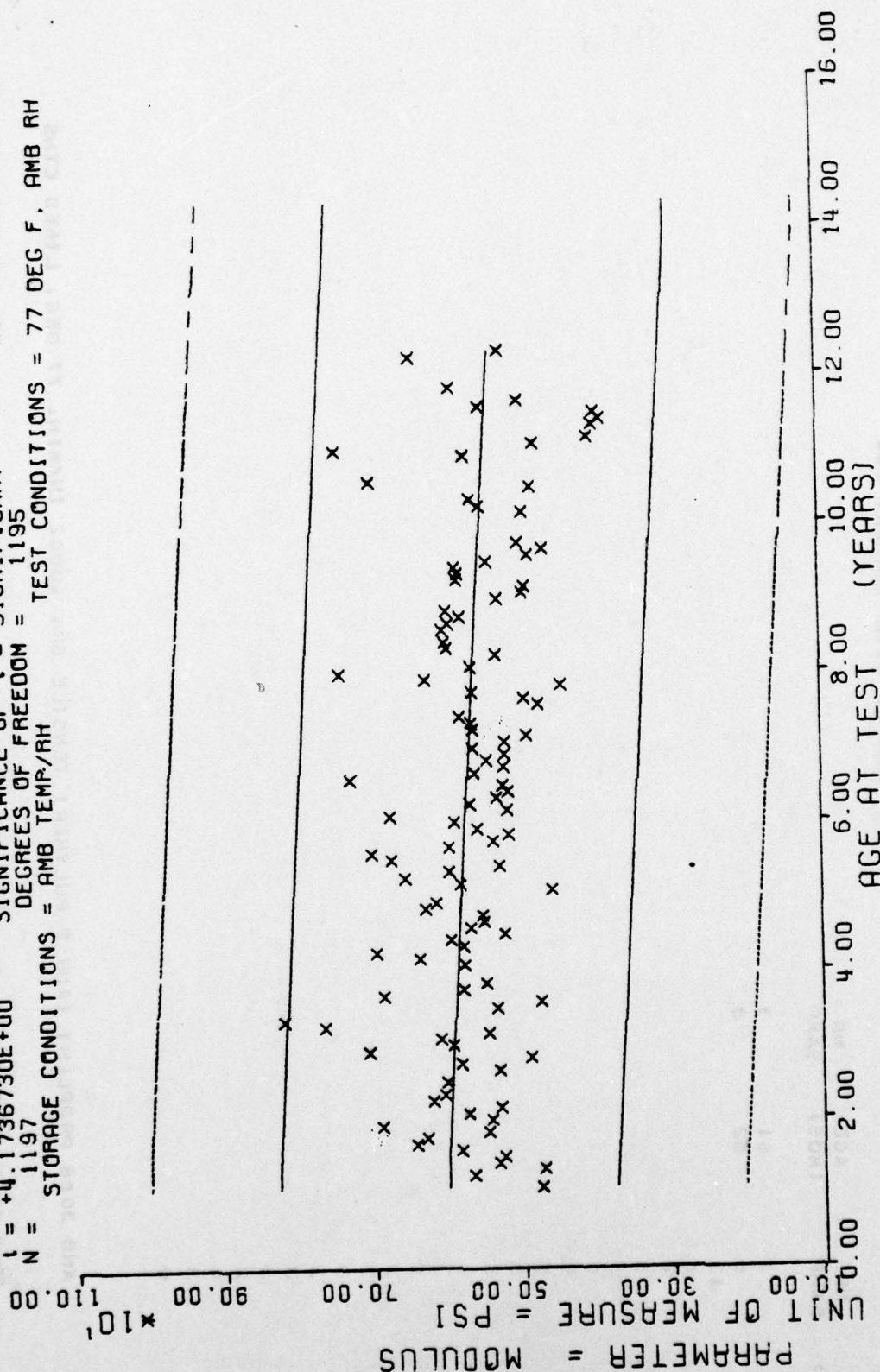


ANB 3066 PROPELLANT (ANB, P) TENSILE STN • RUP, .0002 IN/MIN, UNLND CINS, 77 DG

Figure 4-11



$Y = ((+6.1177583E+02) + (-5.1385938E-01) \times X)$   
 $F = +1.7419546E+01$  SIGNIFICANCE OF F = SIGNIFICANT  
 $R = -1.1986488E-01$  SIGNIFICANCE OF R = SIGNIFICANT  
 $t = +4.1736730E+00$  SIGNIFICANCE OF t = SIGNIFICANT  
 $N = 1197$  DEGREES OF FREEDOM = 1195  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 77 DEG F, AMB RH



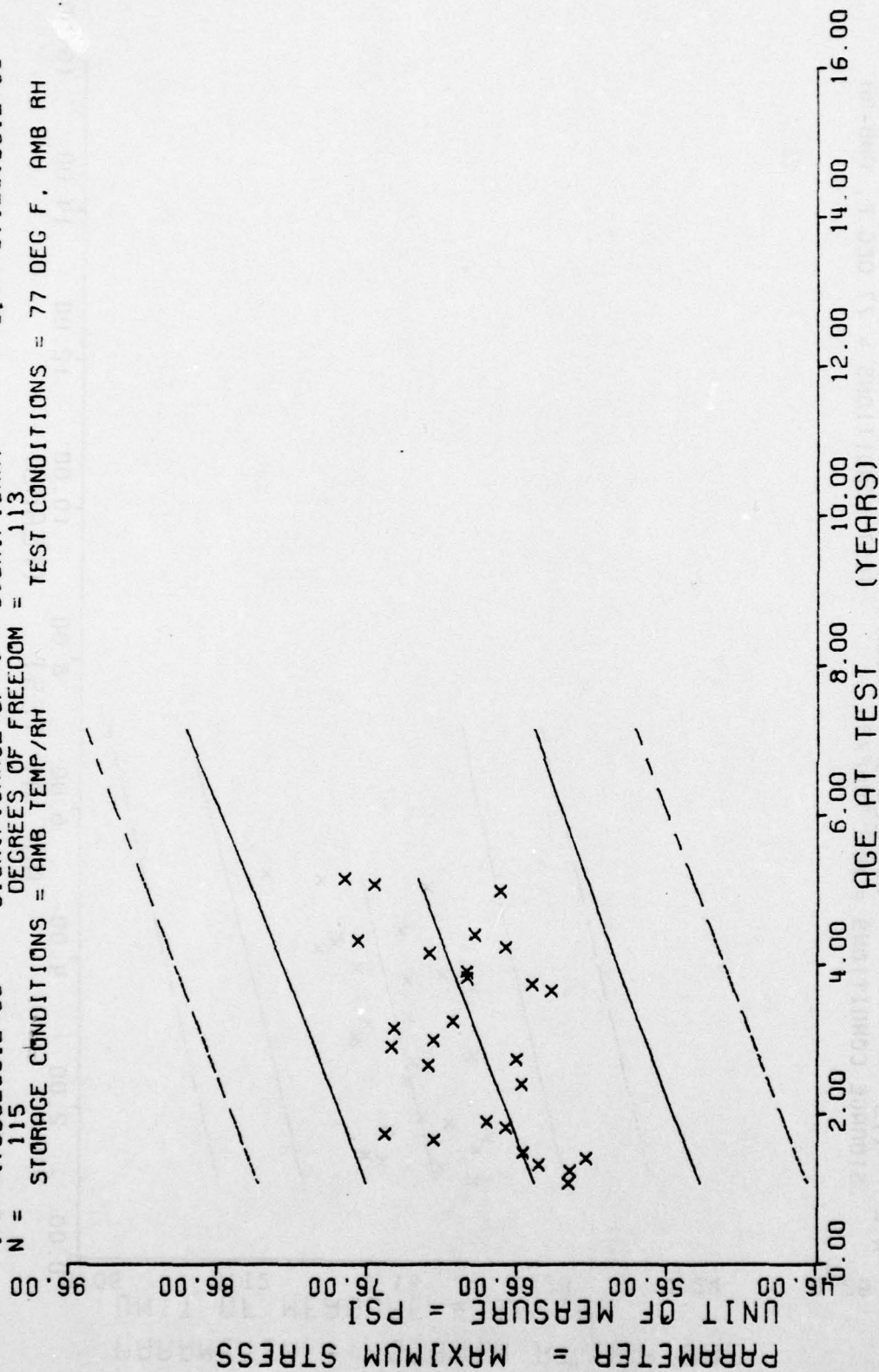
\*\*\* SAMPLE SIZE SUMMARY \*\*\*

AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP
13	3	61	3
15	6	62	3
16	13		
17	6		
19	8		
20	3		
21	3		
22	9		
23	9		
29	3		
32	3		
33	3		
35	3		
36	3		
38	1		
39	3		
44	3		
45	3		
46	3		
47	3		
50	3		
51	2		
52	4		
53	3		
60	6		

ANB 3066 PROPLINT (ANB P POLYMER) TENSILE ER. .0002 IN/MIN. 77 DEG. LINED CTNS

This sample size summary is applicable to figures 4-13, 4-14 and 4-15

$F = +1.8829465E+01$       SIGNIFICANCE OF  $F =$        $(+1.5739714E-01) \times X)$        $\sigma_r = +6.5867728E+00$   
 $R = +3.7793120E-01$       SIGNIFICANCE OF  $R =$       SIGNIFICANT       $S_e = +3.6272531E-02$   
 $t = +4.3392931E+00$       SIGNIFICANCE OF  $t =$       SIGNIFICANT       $S_r = +6.1251801E+00$   
 $N = 115$       DEGREES OF FREEDOM = 113  
 STORAGE CONDITIONS = AMB TEMP/RH      TEST CONDITIONS = 77 DEG F, AMB RH

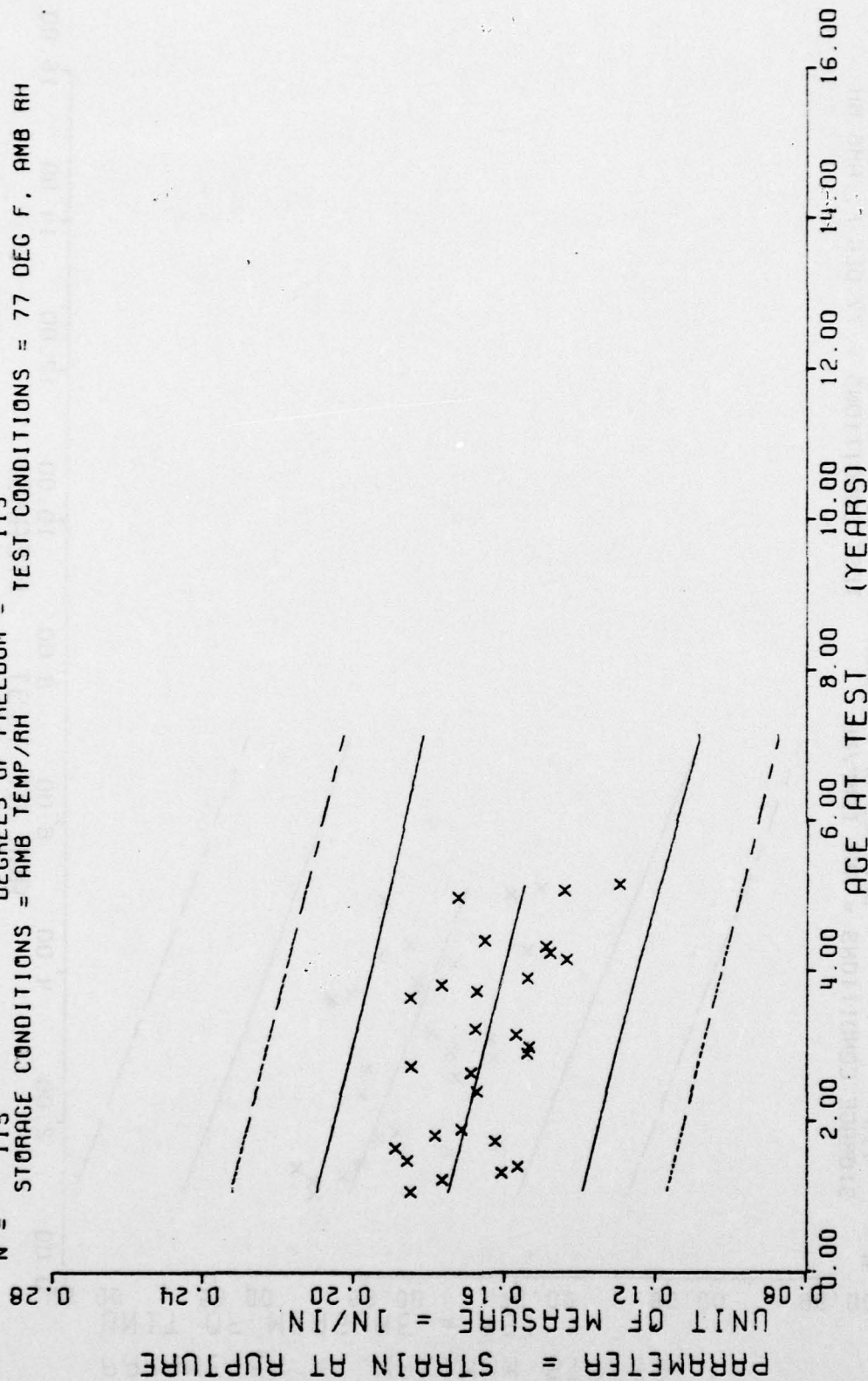


ANB 3066 PAPLLNT (ANB P POLYMER) TENSILE SM, .0002 IN/MIN, 77 DEG, LINED CTNS

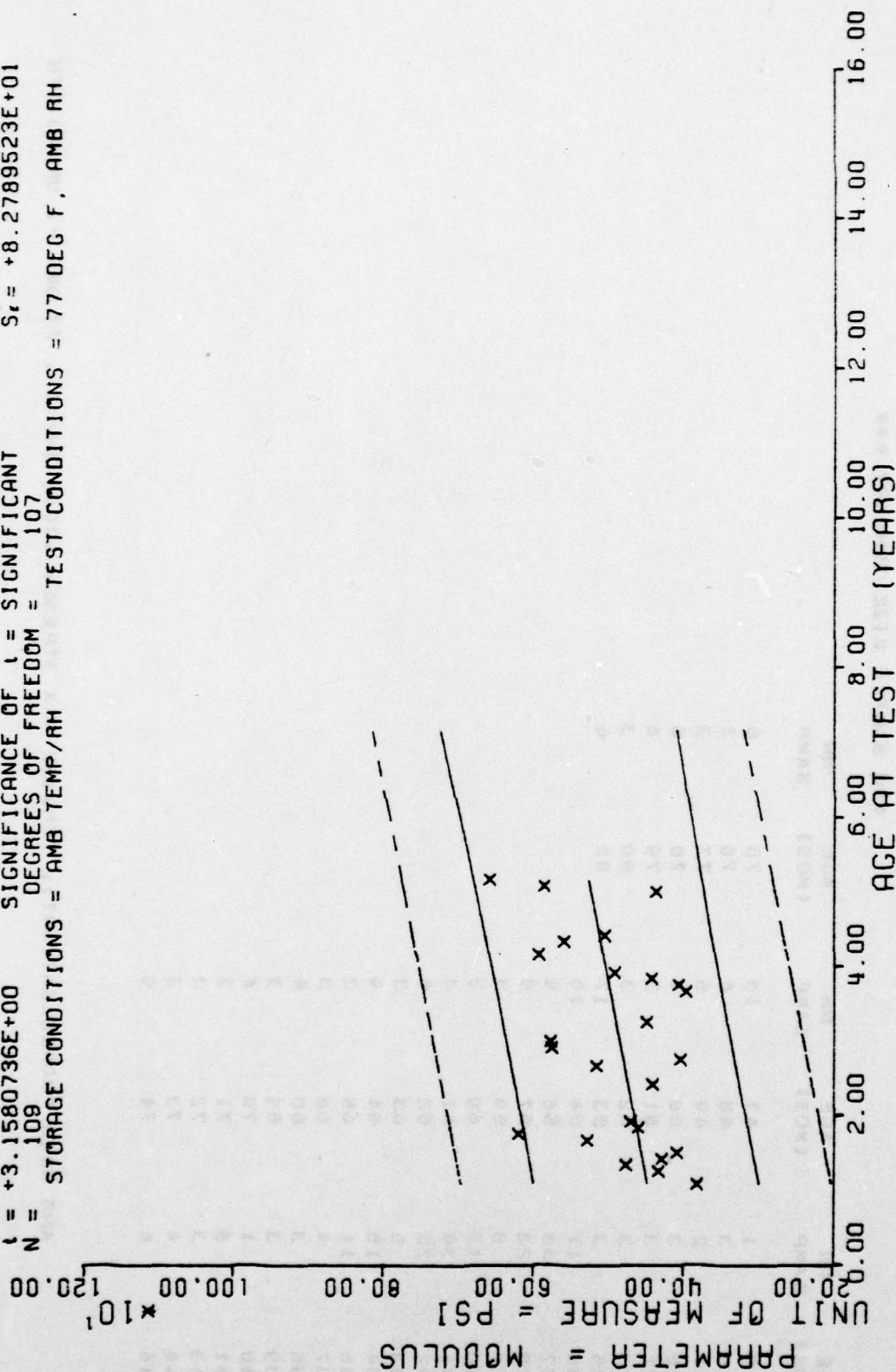
Figure 4-13



$Y = ((+1.8033233E-01) + (-4.1557273E-04) \times X)$   
 $F = +1.3421937E+01$  SIGNIFICANCE OF F = SIGNIFICANT  $G_1 = +2.0171547E-02$   
 $R = -3.2583399E-01$  SIGNIFICANCE OF R = SIGNIFICANT  $S_1 = +1.1343300E-04$   
 $l = +3.6635962E+00$  SIGNIFICANCE OF l = SIGNIFICANT  $S_t = +1.9154923E-02$   
 $N = 115$  DEGREES OF FREEDOM = 113  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 77 DEG F, AMB RH



$Y = ((+4.2911772E+02) + (+1.5946831E+00) \times X)$   
 $F = +9.9734289E+00$  SIGNIFICANCE OF F = SIGNIFICANT  $G_r = +8.6160282E+01$   
 $R = +2.9199716E-01$  SIGNIFICANCE OF R = SIGNIFICANT  $S_p = +5.0495439E-01$   
 $t = +3.1580736E+00$  SIGNIFICANCE OF t = SIGNIFICANT  $S_t = +8.2789523E+01$   
 $N = 109$  DEGREES OF FREEDOM = 107  
 STORAGE CONDITIONS = AMB TEMP/AH TEST CONDITIONS = 77 DEG F, AMB RH



ANB 3066 PROPELLANT (ANB P POLYMER) TENSILE MODULUS, .0002 IN/MIN, 77 DEG, LINED

Figure 4-15

\*\*\* SAMPLE SIZE SUMMARY \*\*\*

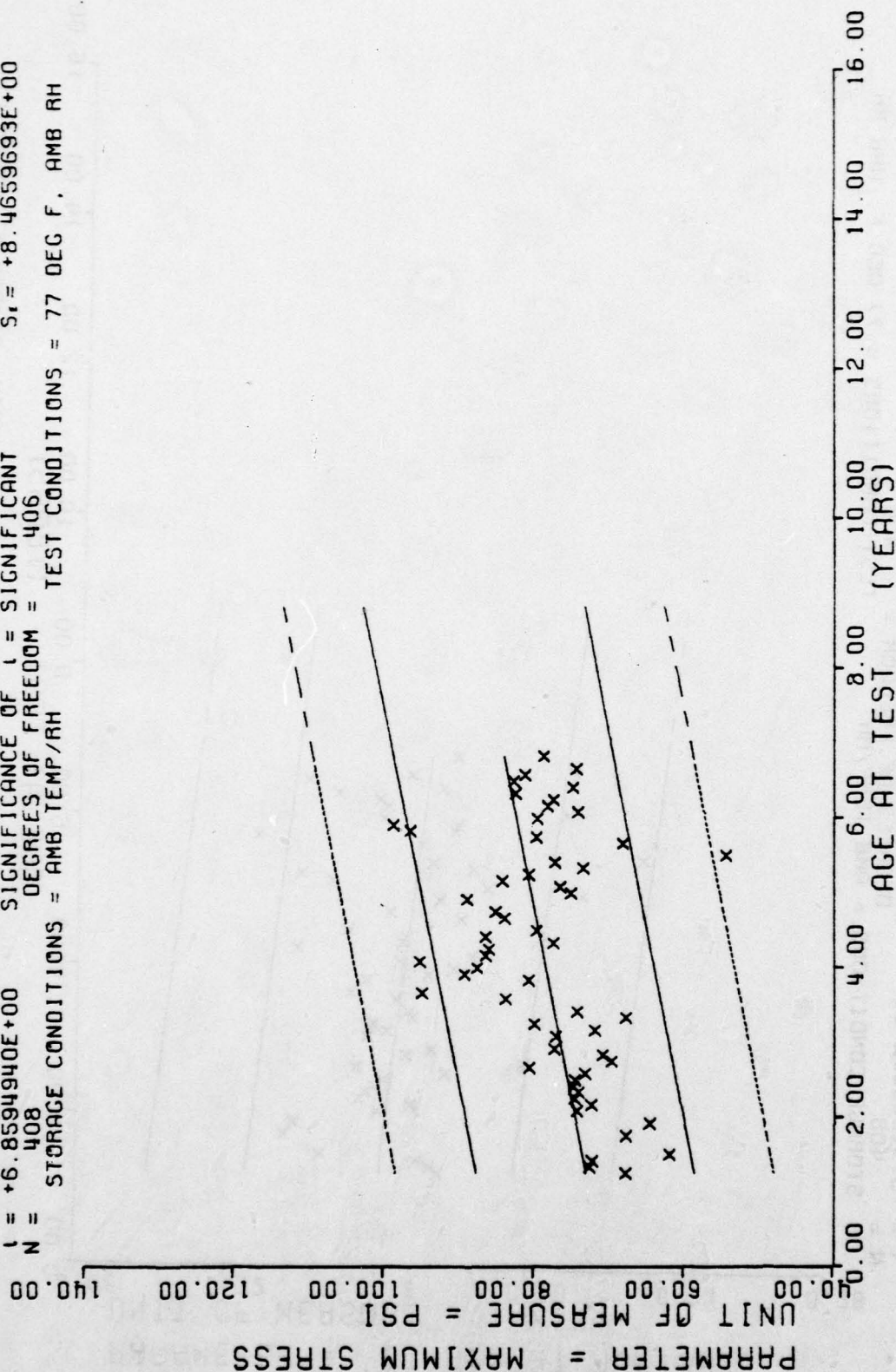
AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP
15	1	47	10	75	6
16	3	48	6	76	3
17	2	49	5	77	3
18	3	50	9	78	6
21	3	51	3	79	6
23	3	52	3	80	3
25	3	53	17	82	6
26	17	54	10		
27	33	56	9		
28	22	57	9		
29	8	59	3		
30	15	60	3		
31	30	61	3		
32	22	62	6		
33	5	63	3		
34	15	64	9		
35	11	65	3		
37	4	66	3		
38	3	68	6		
39	3	69	3		
40	1	70	6		
41	8	71	3		
43	3	72	3		
44	4	73	3		
46	6	74	9		

ANB 3066 PROPELLANT(ANT). TENSILE MAX STRESS, .0002 IN/MIN. 77 DEG F. UNLND CTN

This sample size summary is applicable to figures 4-16, 4-17 and 4-18



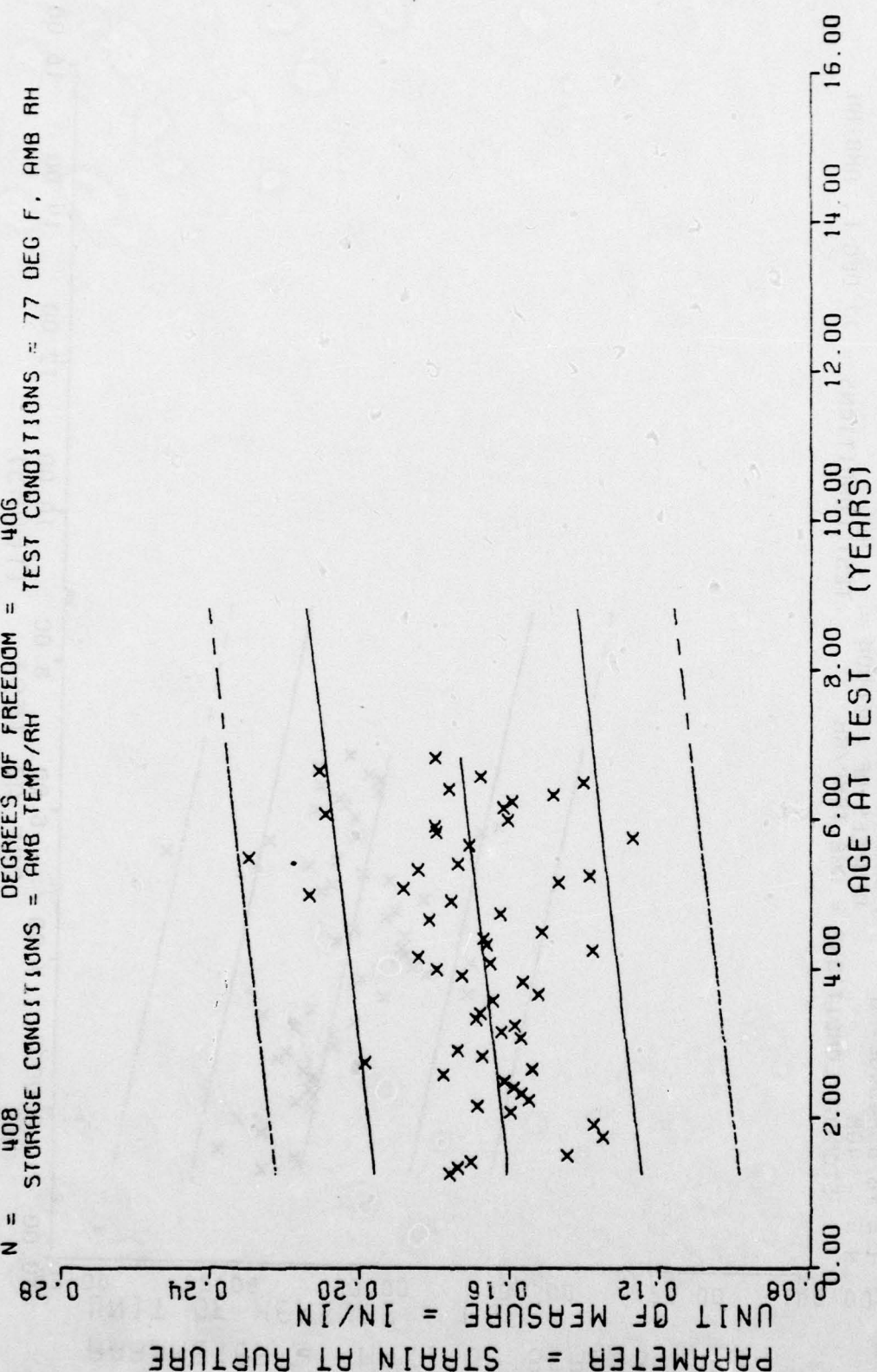
$Y = ((+7.0716194E+01) + (+1.6168939E-01) * X)$   
 $F = +4.7052658E+01$  SIGNIFICANCE OF F = SIGNIFICANT  $\sigma_1 = +8.9321051E+00$   
 $R = +3.2226841E-01$  SIGNIFICANCE OF R = SIGNIFICANT  $S_1 = +2.3571621E-02$   
 $l = +6.8594940E+00$  SIGNIFICANCE OF l = SIGNIFICANT  $S_1 = +8.4659693E+00$   
 $N = 408$  DEGREES OF FREEDOM = 406  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 77 DEG F, AMB RH



ANB 3066 PROPELLANT (ANT), TENSILE MAX STRESS, .0002 IN/MIN, 77 DEG F, UNLND CTN

Figure 4-16

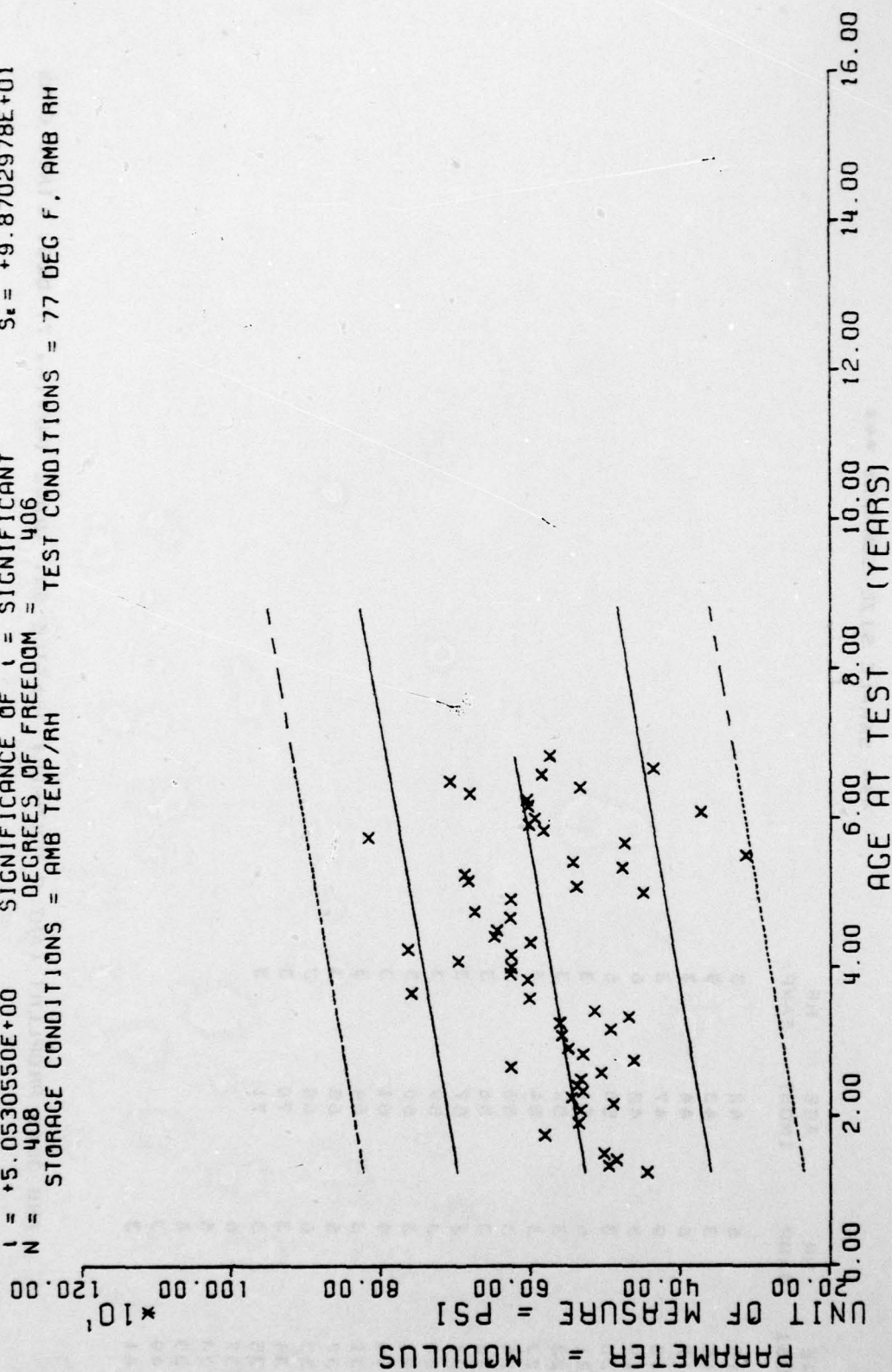
$Y = ((+1.5790039E-01) + (+1.9139677E-04) * X)$   
 $F = +1.1012878E+01$  SIGNIFICANCE OF F = SIGNIFICANT  $S_e = +2.0967611E-02$   
 $R = +1.6250835E-01$  SIGNIFICANCE OF R = SIGNIFICANT  $S_b = +5.7674548E-05$   
 $t = +3.3185656E+00$  SIGNIFICANCE OF t = SIGNIFICANT  $S_c = +2.0714355E-02$   
 $N = 408$  DEGREES OF FREEDOM = 406  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 77 DEG F, AMB RH



AMB 3066 PROPELLANT (ANT), TENSILE STN AT RUPT, .0002 IN/MIN, 77 DEG F, UNLND CT

Figure 4-17

$F = +2.5533365E+01$  SIGNIFICANCE OF F =  $(+1.3886636E+00) \times X$   $\sigma_r = +1.0163428E+02$   
 $R = +2.4324663E-01$  SIGNIFICANCE OF R = SIGNIFICANT  $S_e = +2.7481664E-01$   
 $I = +5.0530550E+00$  SIGNIFICANCE OF I = SIGNIFICANT  $S_e = +9.8702978E+01$   
 $N = 408$  DEGREES OF FREEDOM = 406  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 77 DEG F, AMB RH



ANB 3066 PROPELLANT (ANT), TENSILE MODULUS, 0.0002 IN/MIN, 77 DEG F, UNLND CTN

Figure 4-18



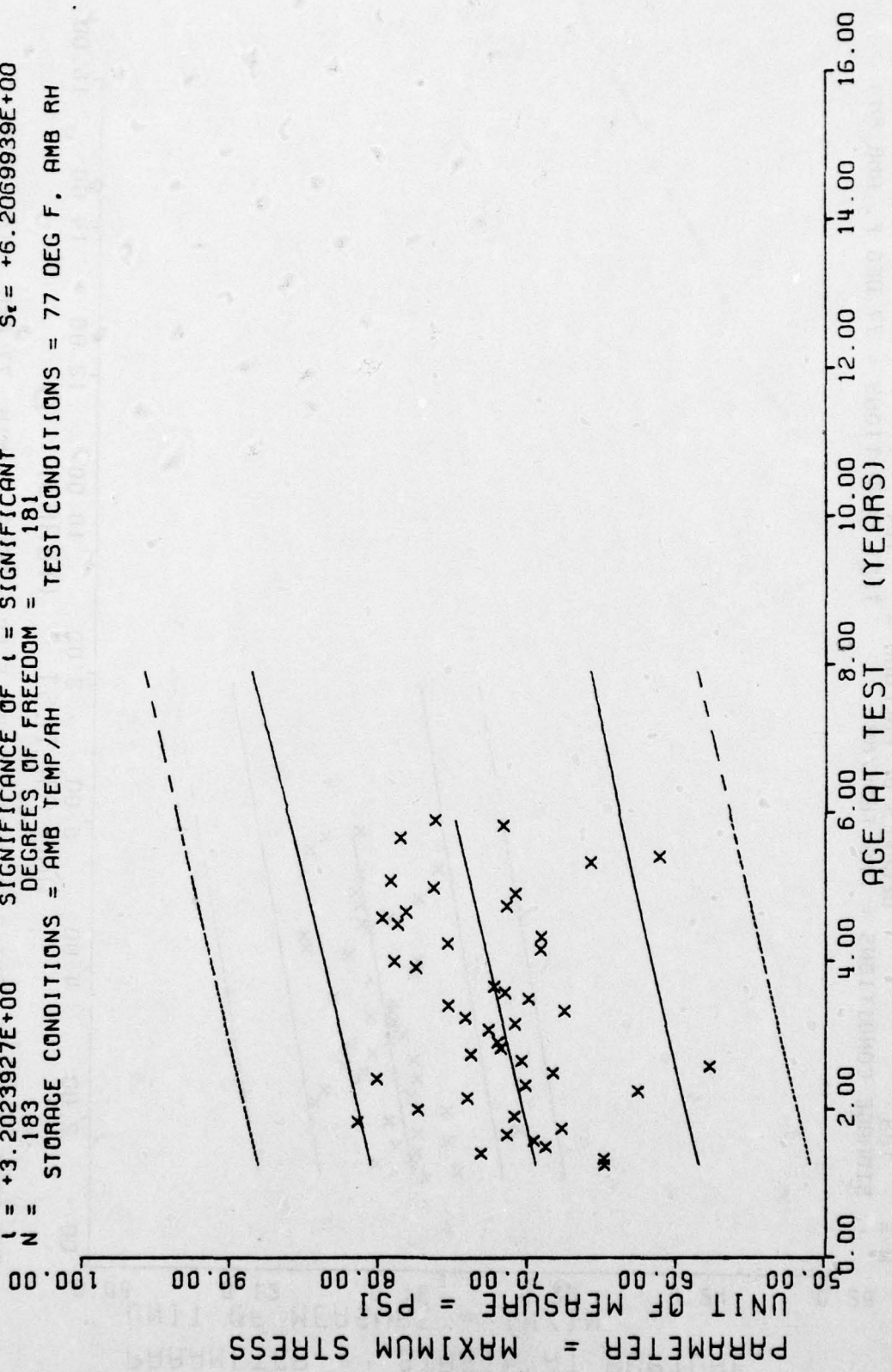
\*\*\* SAMPLE SIZE SUMMARY \*\*\*

AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP
15	6	42	3
16	3	43	9
17	6	44	3
18	9	47	3
19	3	48	6
20	3	50	6
21	6	51	3
22	3	52	3
23	3	54	3
24	3	55	3
26	3	56	3
27	3	57	3
28	3	59	3
29	3	60	3
30	9	61	3
31	3	64	3
32	6	65	3
33	6	68	3
34	3	70	3
35	3	71	3
37	6		
38	6		
39	6		
40	3		
41	3		

ANB 3066 PROPLNT (ANT P POLYMER) TENSILE SM. .0002 IN/MIN. 77 DEG. LINED CTNS

This sample size summary is applicable to figures 4-19, 4-20 and 4-21

$Y = (( +6.808889E+01 ) + ( +9.5050654E-02 ) * X)$   
 $F = +1.0255319E+01$  SIGNIFICANCE OF F = SIGNIFICANT  $\sigma_r = +6.3628603E+00$   
 $R = +2.3156229E-01$  SIGNIFICANCE OF R = SIGNIFICANT  $S_e = +2.9681135E-02$   
 $l = +3.2023927E+00$  SIGNIFICANCE OF l = SIGNIFICANT  $S_r = +6.2069939E+00$   
 $N = 183$  DEGREES OF FREEDOM = 181  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 77 DEG F, AMB RH



ANB 3066 PROPLNT (ANT P POLYMER) TENSILE SM, .0002 IN/MIN, 77 DEG, LINED CTNS

Figure 4-19

$Y = ((+1.7115171E-01) + (-3.0848599E-04) \times X)$   
 $F = +2.2464997E+01$  SIGNIFICANCE OF F = SIGNIFICANT  $\sigma_r = +1.4391041E-02$   
 $R = -3.3228315E-01$  SIGNIFICANCE OF R = SIGNIFICANT  $S_e = +6.5085203E-05$   
 $t = +4.7397254E+00$  SIGNIFICANCE OF t = SIGNIFICANT  $S_e = +1.3610782E-02$   
 $N = 183$  DEGREES OF FREEDOM = 181  
 STORAGE CONDITIONS = AMB TEMP/AH TEST CONDITIONS = 77 DEG F, AMB RH

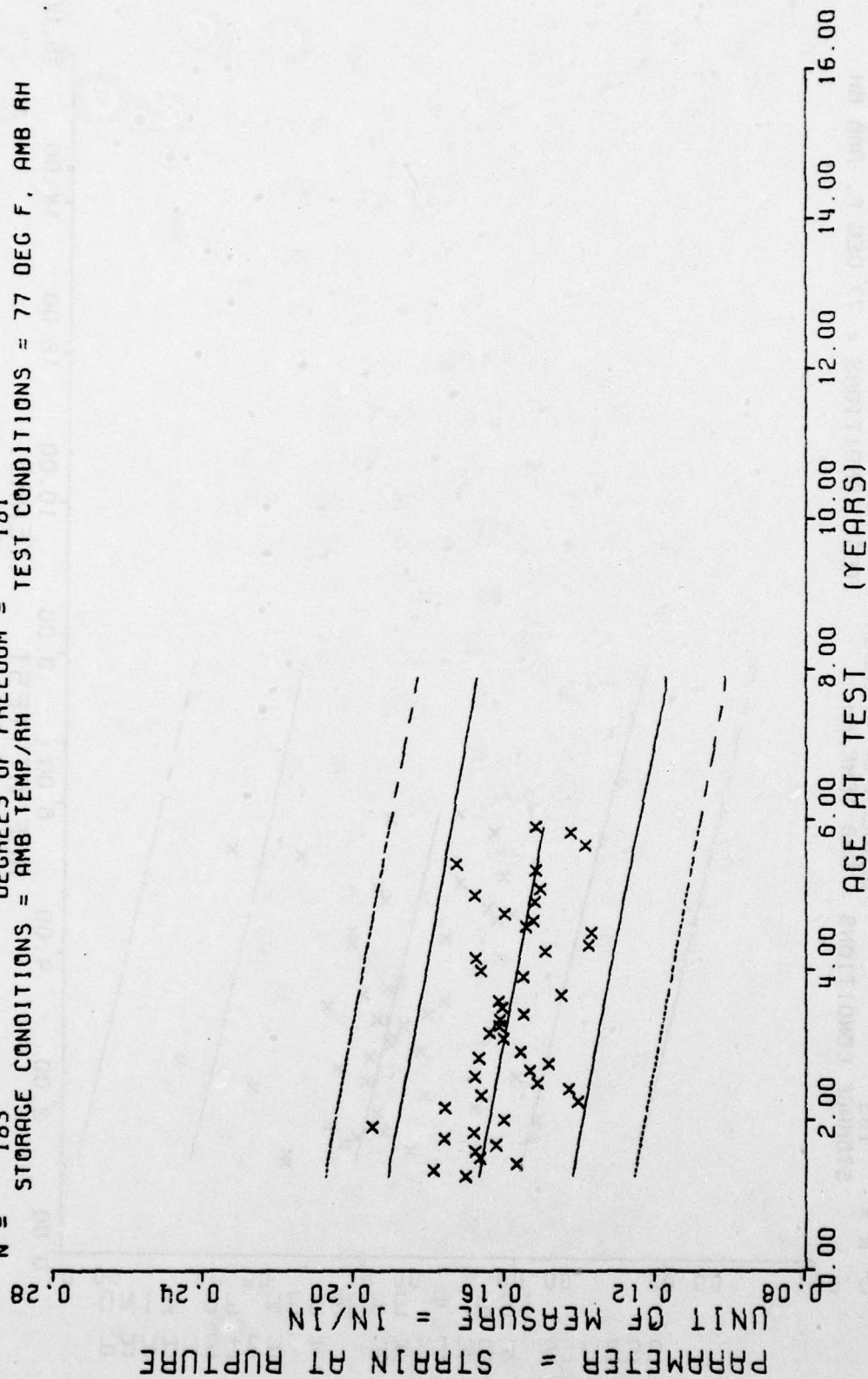
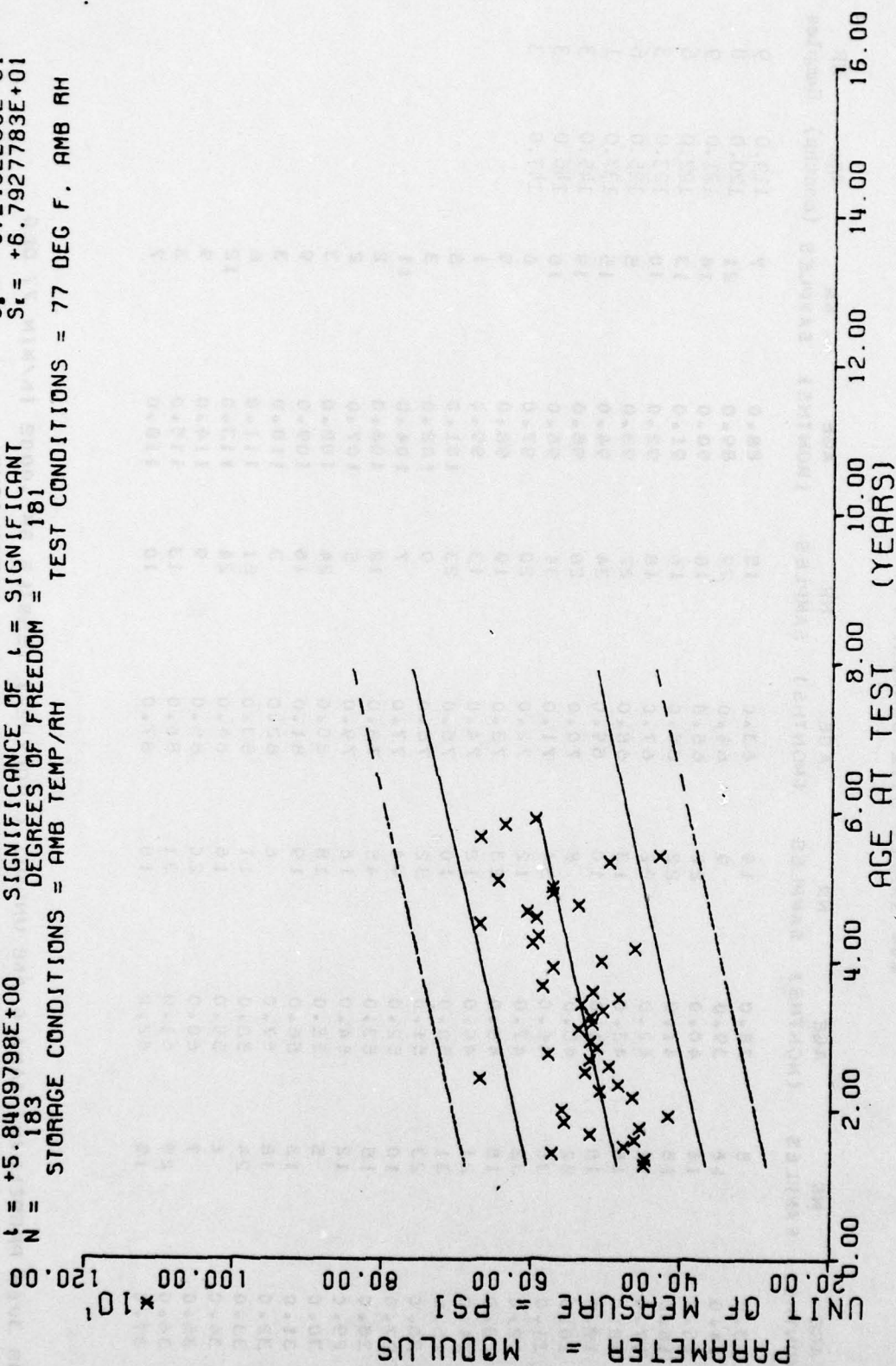


Figure 4-20



$F = +3.4117045E+01$   
 $R = +3.9824313E-01$   
 $t = +5.8409798E+00$   
 $N = 183$   
 $Y = (( +4.5857997E+02 ) + ( +1.8972839E+00 ) \times X)$   
 SIGNIFICANCE OF F = SIGNIFICANT  
 SIGNIFICANCE OF R = SIGNIFICANT  
 SIGNIFICANCE OF t = SIGNIFICANT  
 DEGREES OF FREEDOM = 181  
 STORAGE CONDITIONS = AMB TEMP/AH  
 TEST CONDITIONS = 77 DEG F, AMB RH



ANB 3066 PROPELLANT (ANT P POLYMER) TENSILE MODULUS, .0002 IN/MIN, 77 DEG, LINED

Figure 4-21

### \*\*\* SAMPLE SIZE SUMMARY \*\*\*

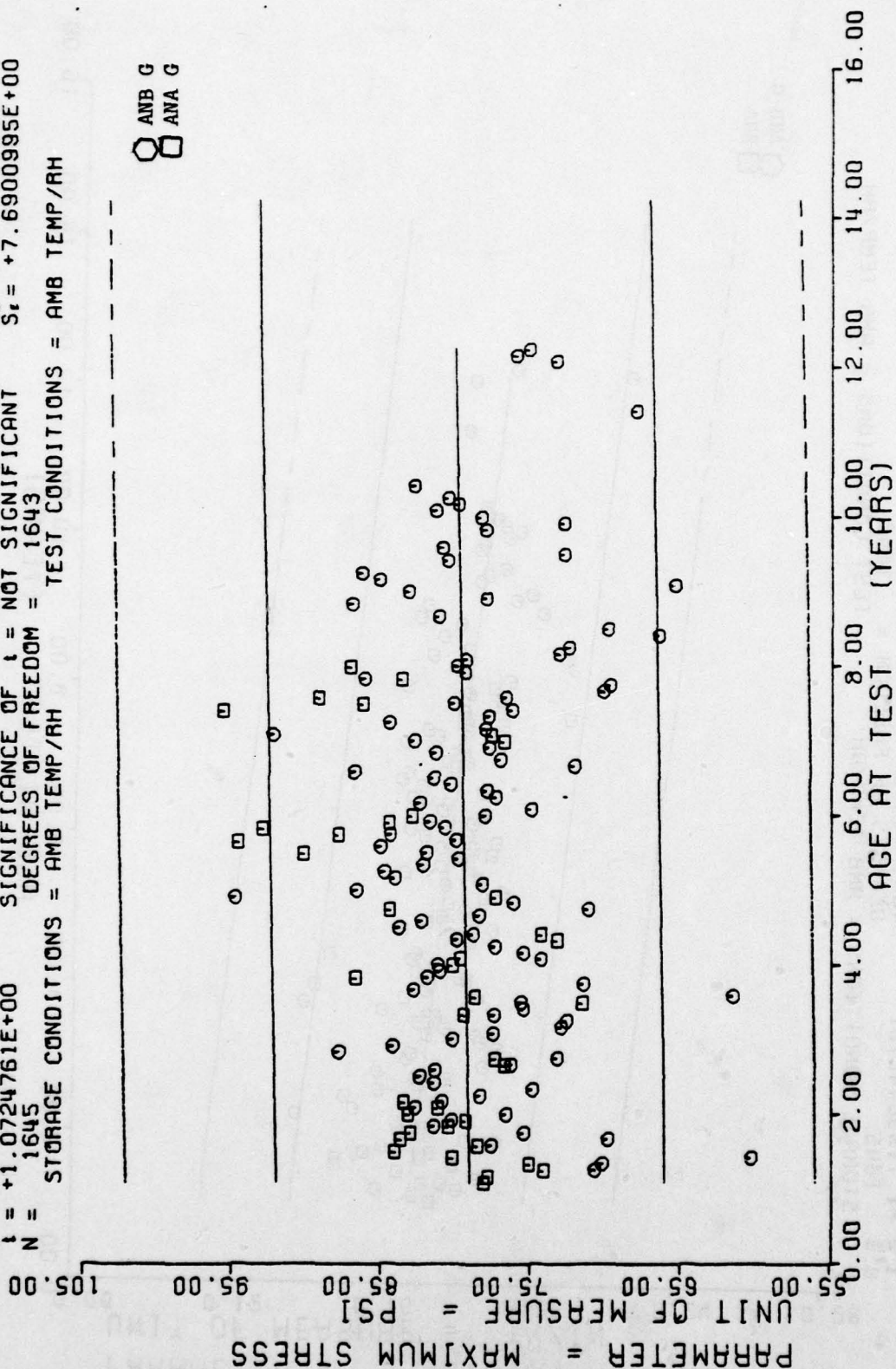
AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES
13.0	5	38.0	15	63.0	15	88.0	7	119.0	9
14.0	16	39.0	9	64.0	29	89.0	21	120.0	8
15.0	14	40.0	22	65.0	18	90.0	14	121.0	9
16.0	18	41.0	22	66.0	16	91.0	13	122.0	6
17.0	12	42.0	22	67.0	18	92.0	10	123.0	3
18.0	15	43.0	13	68.0	27	93.0	5	125.0	6
19.0	18	44.0	10	69.0	34	94.0	15	137.0	1
20.0	22	45.0	8	70.0	28	95.0	19	145.0	3
21.0	38	46.0	34	71.0	34	96.0	18	146.0	3
22.0	32	47.0	12	72.0	20	97.0	6	147.0	3
23.0	15	48.0	23	73.0	19	98.0	9		
24.0	21	49.0	18	74.0	13	99.0	1		
25.0	31	50.0	10	75.0	23	101.0	8		
26.0	23	51.0	32	76.0	9	102.0	3		
27.0	10	52.0	44	77.0	7	104.0	11		
28.0	15	53.0	45	78.0	12	106.0	2		
29.0	12	54.0	16	79.0	5	107.0	2		
30.0	5	55.0	18	80.0	24	108.0	3		
31.0	13	56.0	19	81.0	16	109.0	9		
32.0	18	57.0	6	82.0	3	110.0	3		
33.0	24	58.0	11	83.0	21	111.0	6		
34.0	6	59.0	16	84.0	24	113.0	12		
35.0	7	60.0	20	85.0	9	114.0	9		
36.0	28	61.0	31	86.0	13	115.0	3		
37.0	15	62.0	18	87.0	10	118.0	7		

ANB 3066 PROPELLANT (ANA 6 ANB UNLND, G POLYMER) TENSILE SM .0002 IN/MIN 77 DEG

This sample size summary is applicable to figures 4-22, 4-23 and 4-24

$F = +1.1502051E+00$   
 $R = +2.6449466E-02$   
 $t = +1.0724761E+00$   
 $N = 1645$   
 $Y = (( +7.8945974E+01 ) + ( +7.2483446E-03 ) * X)$   
 SIGNIFICANCE OF F = NOT SIGNIFICANT  
 SIGNIFICANCE OF R = NOT SIGNIFICANT  
 SIGNIFICANCE OF t = NOT SIGNIFICANT  
 DEGREES OF FREEDOM = 1643  
 STORAGE CONDITIONS = AMB TEMP/RH  
 TEST CONDITIONS = AMB TEMP/RH

ANB G  
 ANA G

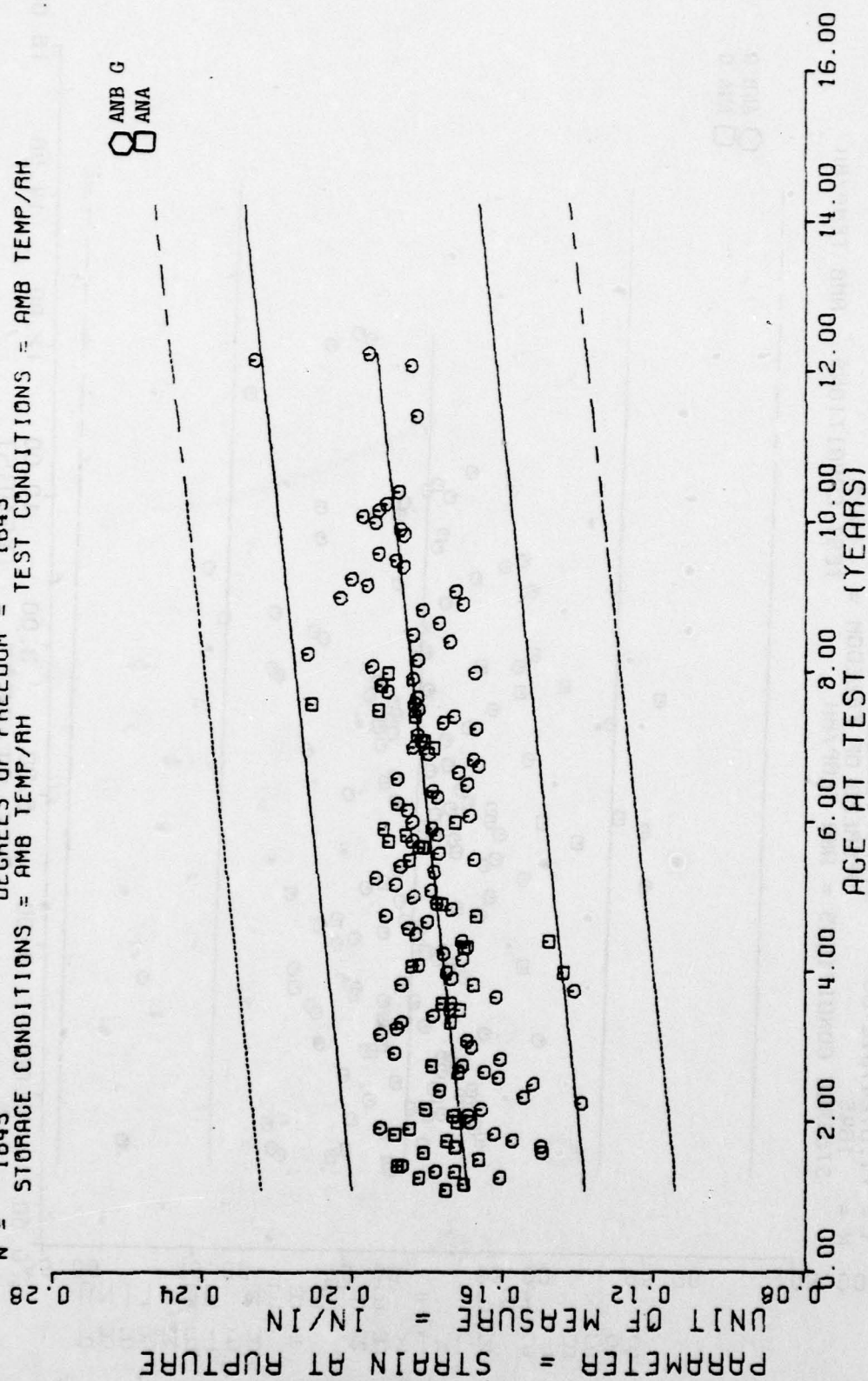


ANB 3066 PROPELLANT (ANA & ANB UNLND, G POLYMER) TENSILE SM .0002 IN/MIN 77 DEG

Figure 4-22



$F = +1.2528424E+02$   
 $R = +2.6617802E-01$   
 $L = +1.1193044E+01$   
 $N = 1645$   
 $Y = ((+1.6679974E-01) + (+1.8021145E-04) * X)$   
 SIGNIFICANCE OF F = SIGNIFICANT  
 SIGNIFICANCE OF R = SIGNIFICANT  
 SIGNIFICANCE OF L = SIGNIFICANT  
 DEGREES OF FREEDOM = 1643  
 STORAGE CONDITIONS = AMB TEMP/RH  
 TEST CONDITIONS = AMB TEMP/RH

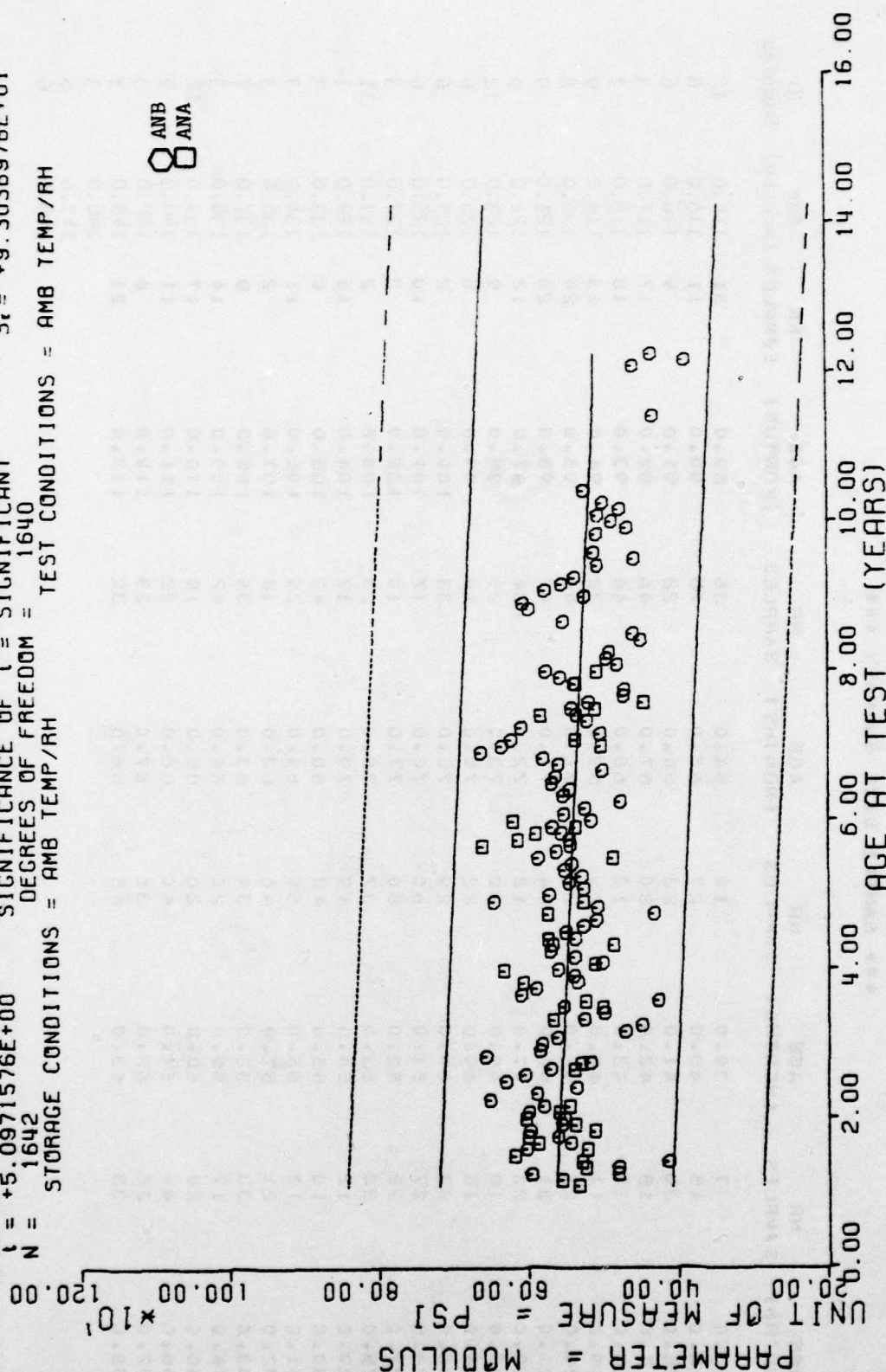


ANB 3066 PROPELLANT (ANA & ANB UNLND, G POLYMER) TENSILE ER .0002 IN/MIN 77 DEG

Figure 4-23

$Y = ((+5.7018583E+02) + (-4.1728100E-01) \times X)$   
 $F = +2.5981016E+01$  SIGNIFICANCE OF F = SIGNIFICANT  
 $R = -1.2488004E-01$  SIGNIFICANCE OF R = SIGNIFICANT  
 $t = +5.0971576E+00$  SIGNIFICANCE OF t = SIGNIFICANT  
 $N = 1642$  DEGREES OF FREEDOM = 1640  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH

ANB  
 ANA



ANB 3066 PROPELLANT (ANA & ANB UNLND, G POLYMER) TENSILE MODULUS, .0002 IN/MIN

Figure 4-24

[illegible]

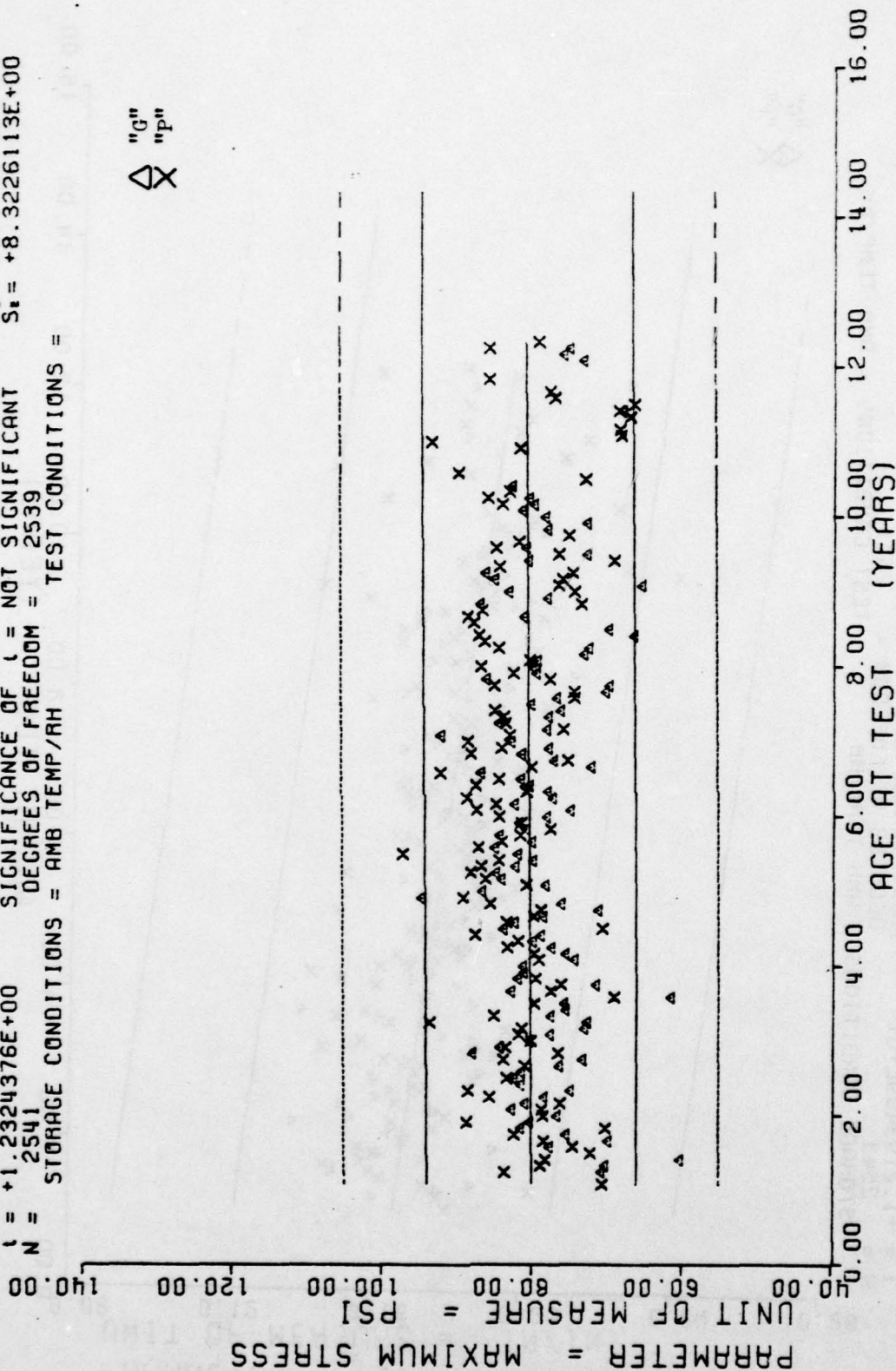
ANB 3066 PROPLNT (ANB UNLINED, G & F POLYMER) TENSILE MAX STRESS, .0002 IN/MIN

This sample size summary is applicable to figures 4-25, 4-26 and 4-27



$Y = ((+7.9903387E+01) + (+6.9939291E-03) \times X)$   
 $F = +1.5189025E+00$  SIGNIFICANCE OF F = NOT SIGNIFICANT  $\sigma = +8.3234614E+00$   
 $R = +2.4451400E-02$  SIGNIFICANCE OF R = NOT SIGNIFICANT  $S_e = +5.6748746E-03$   
 $t = +1.2324376E+00$  SIGNIFICANCE OF t = NOT SIGNIFICANT  $S_e = +8.3226113E+00$   
 $N = 254$  DEGREES OF FREEDOM = 2539  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS =

"G"  
 "P"  
 X



ANB 3066 PROPLANT (AMB UNLINED, G & P POLYMER) TENSILE MAX STRESS, .0002 IN/MIN

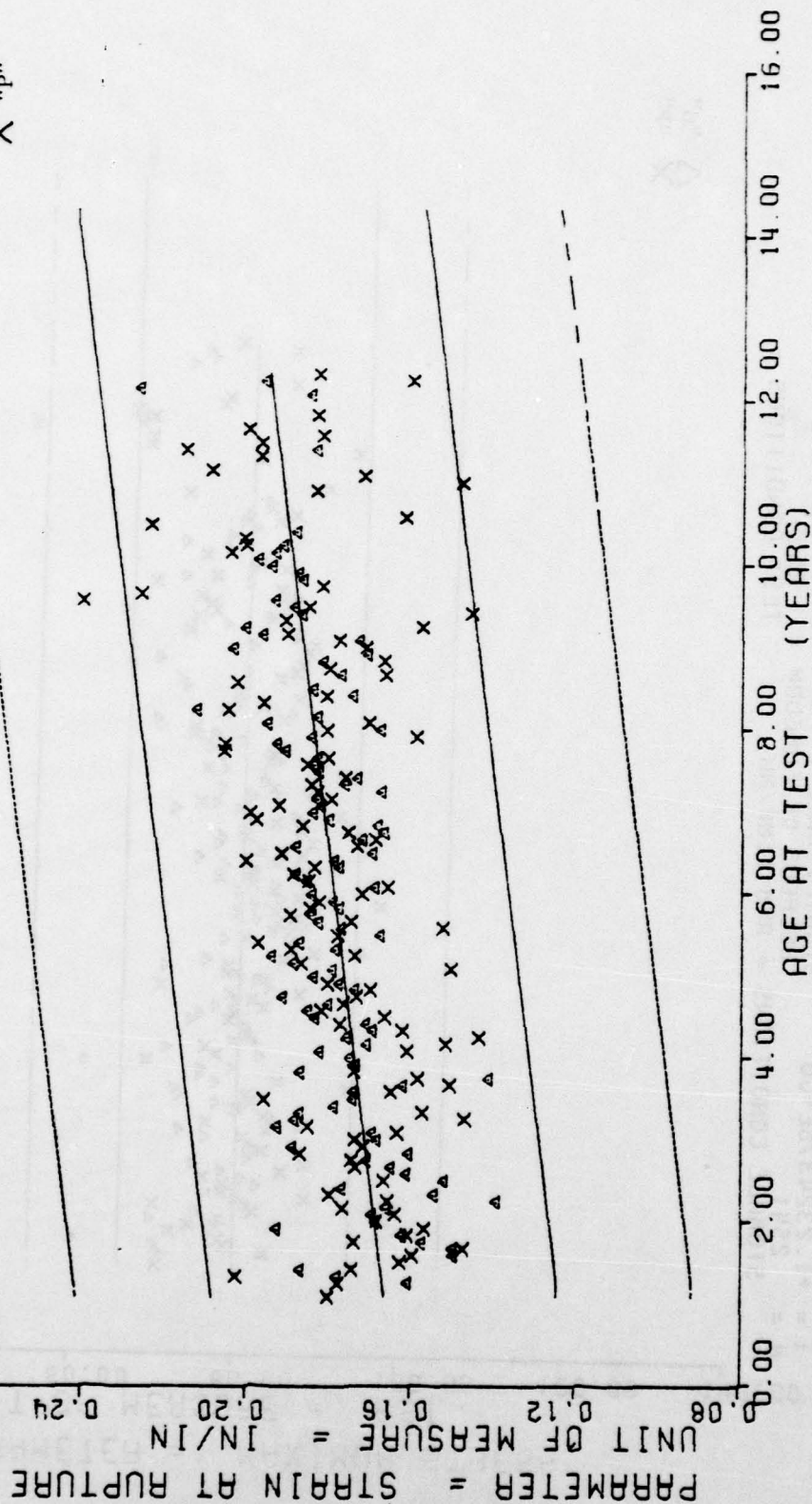
Figure 4-25

$F = +1.4868143E+02$   
 $R = +2.3511370E-01$   
 $t = +1.2193499E+01$   
 $N = 2543$

$Y = ((+1.6372241E-01) + (+2.0743409E-04) * X)$   
 SIGNIFICANCE OF F = SIGNIFICANT  
 SIGNIFICANCE OF R = SIGNIFICANT  
 SIGNIFICANCE OF t = SIGNIFICANT  
 DEGREES OF FREEDOM = 2541

STORAGE CONDITIONS = AMB TEMP/RH  
 TEST CONDITIONS = AMB TEMP/RH

"g"  
 "p"

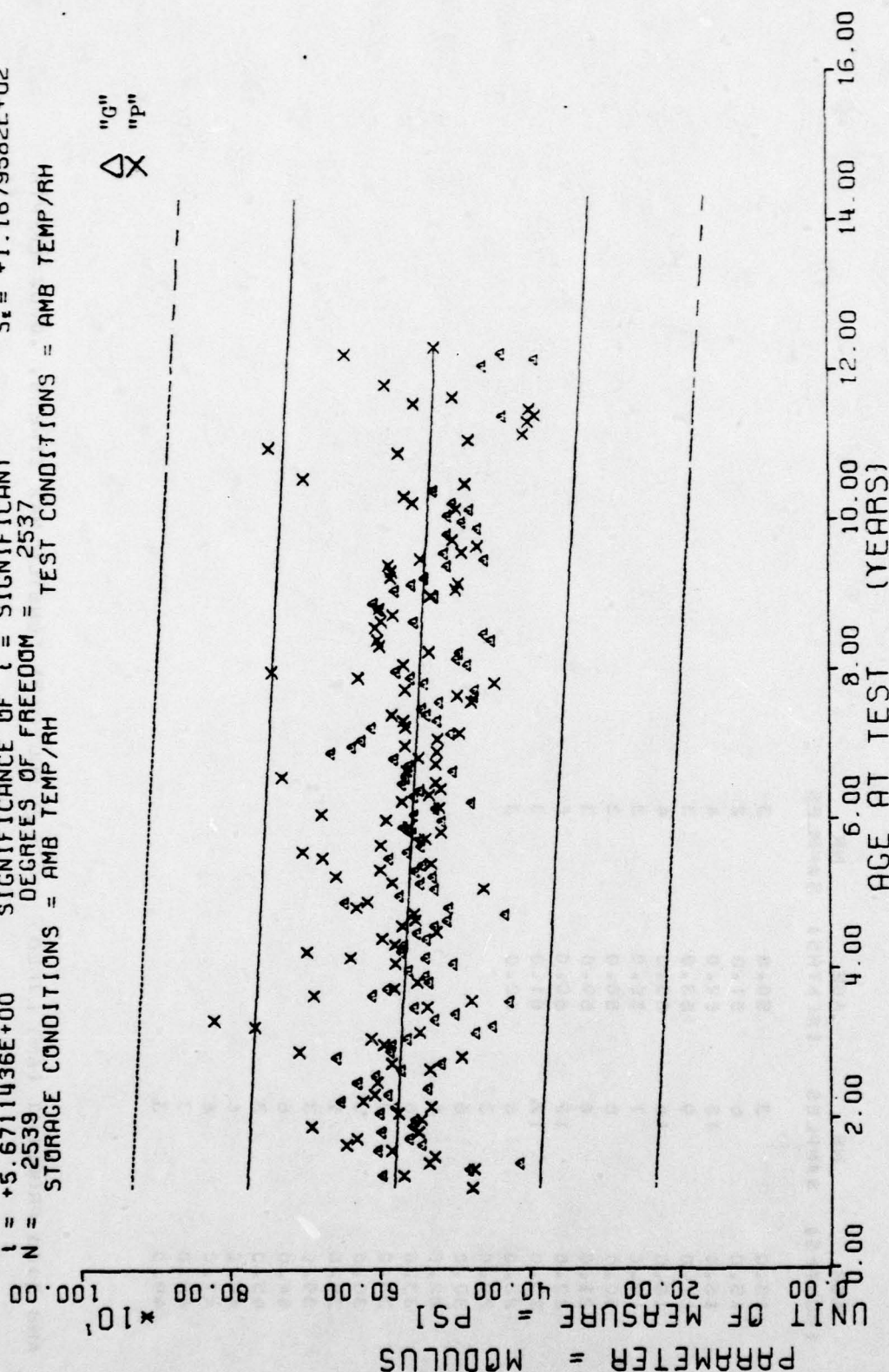


ANB 3066 PROPLANT (AMB UNLINED, G & P POLYMER) TENSILE STN • RUPT, .0002 IN/MIN

Figure 4-26

$Y = ((+5.8935995E+02) + (-4.5187017E-01) * X)$   
 $F = +3.2161869E+01$  SIGNIFICANCE OF F = SIGNIFICANT  
 $R = -1.1188578E-01$  SIGNIFICANCE OF R = SIGNIFICANT  
 $t = +5.6711436E+00$  SIGNIFICANCE OF t = SIGNIFICANT  
 $N = 2539$  DEGREES OF FREEDOM = 2537  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH

"G"  
 "P"



ANB 3066 PROPLANT (AMB UNLINED, G & P POLYMER) TENSILE MODULUS, .0002 IN/MIN

Figure 4-27



\*\*\* SAMPLE SIZE SUMMARY \*\*\*

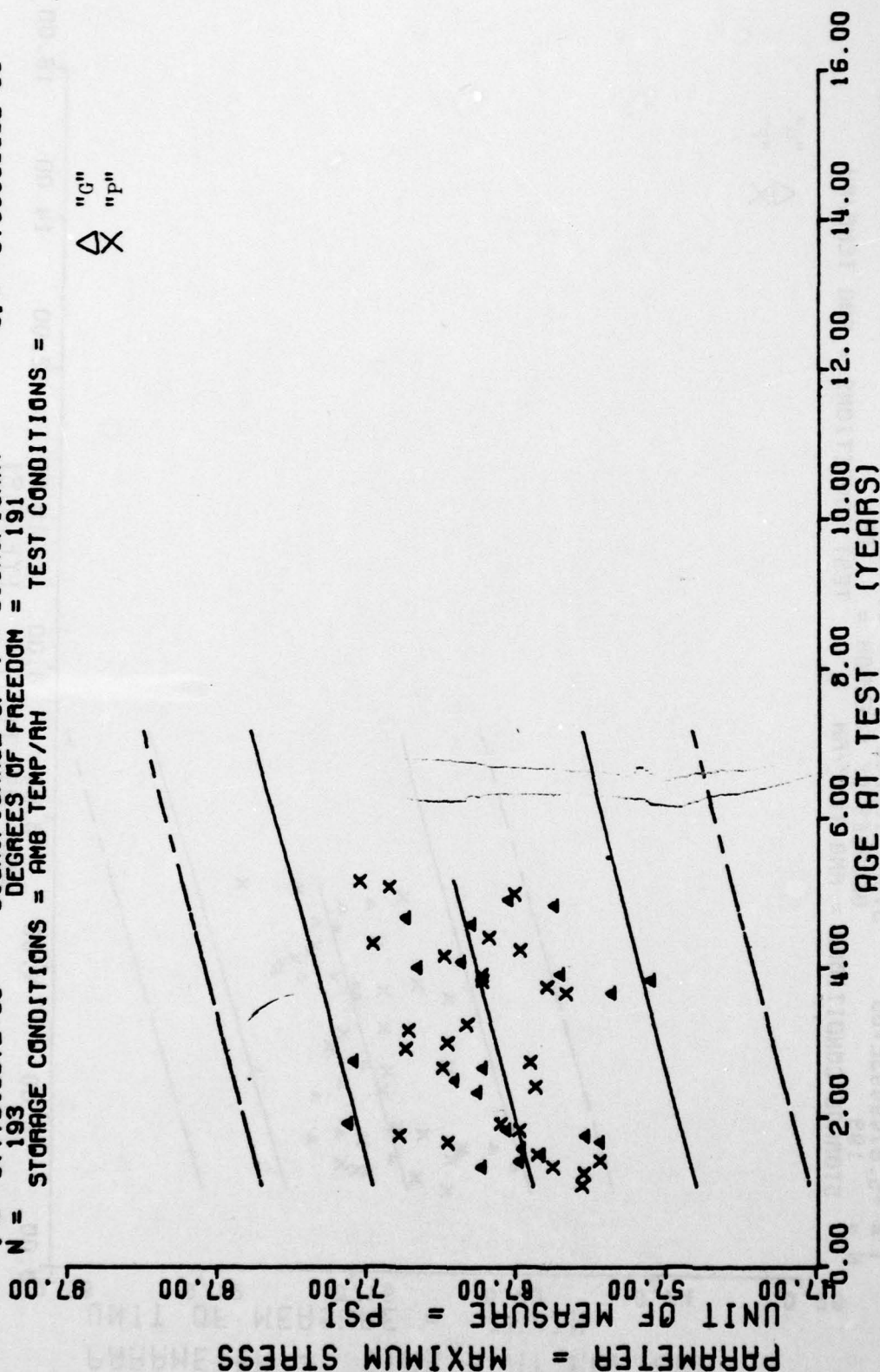
AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES
13.0	3	50.0	3
15.0	6	51.0	2
16.0	15	52.0	4
17.0	9	53.0	3
18.0	16	55.0	4
19.0	7	56.0	3
20.0	6	58.0	3
21.0	6	59.0	3
22.0	12	60.0	6
23.0	12	61.0	3
28.0	6	62.0	3
29.0	3		
30.0	6		
32.0	6		
33.0	6		
35.0	3		
36.0	3		
38.0	1		
39.0	3		
44.0	6		
45.0	3		
46.0	6		
47.0	6		
48.0	3		
49.0	3		

ANB 3066 PROPLNT (ANB LINED) G & P POLYMER) TENSILE MAX STRESS, .0002 IN/MIN

This sample size summary is applicable to figures 4-28, 4-29 and 4-30

$Y = ((+6.4401669E+01) + (+1.0829596E-01) \times X)$   
 $F = +1.4274332E+01$  SIGNIFICANCE OF F = SIGNIFICANT  $\sigma = +6.3063826E+00$   
 $R = +2.6370027E-01$  SIGNIFICANCE OF R = SIGNIFICANT  $S_e = +2.8663838E-02$   
 $t = +3.7781387E+00$  SIGNIFICANCE OF t = SIGNIFICANT  $S_r = +6.0990698E+00$   
 $N = 193$  DEGREES OF FREEDOM = 191  
 STORAGE CONDITIONS = AMB TEMP/AM TEST CONDITIONS =

"G"  
 "P"



ANB 3066 PROPELLANT (AMB LINED) G & P POLYMER TENSILE MAX STRESS, .0002 IN/MIN

Figure 4-28

$\gamma = ((+1.8136764E-01) + (-5.0828748E-04) \times X)$   
 $F = +3.4515030E+01$  SIGNIFICANCE OF F = SIGNIFICANT  $\sigma_r = +1.9951321E-02$   
 $R = -3.9121579E-01$  SIGNIFICANCE OF R = SIGNIFICANT  $S_e = +8.6517764E-05$   
 $t = +5.8749493E+00$  SIGNIFICANCE OF t = SIGNIFICANT  $S_i = +1.8409184E-02$   
 $N = 193$  DEGREES OF FREEDOM = 191  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH

"G"  
 "P"

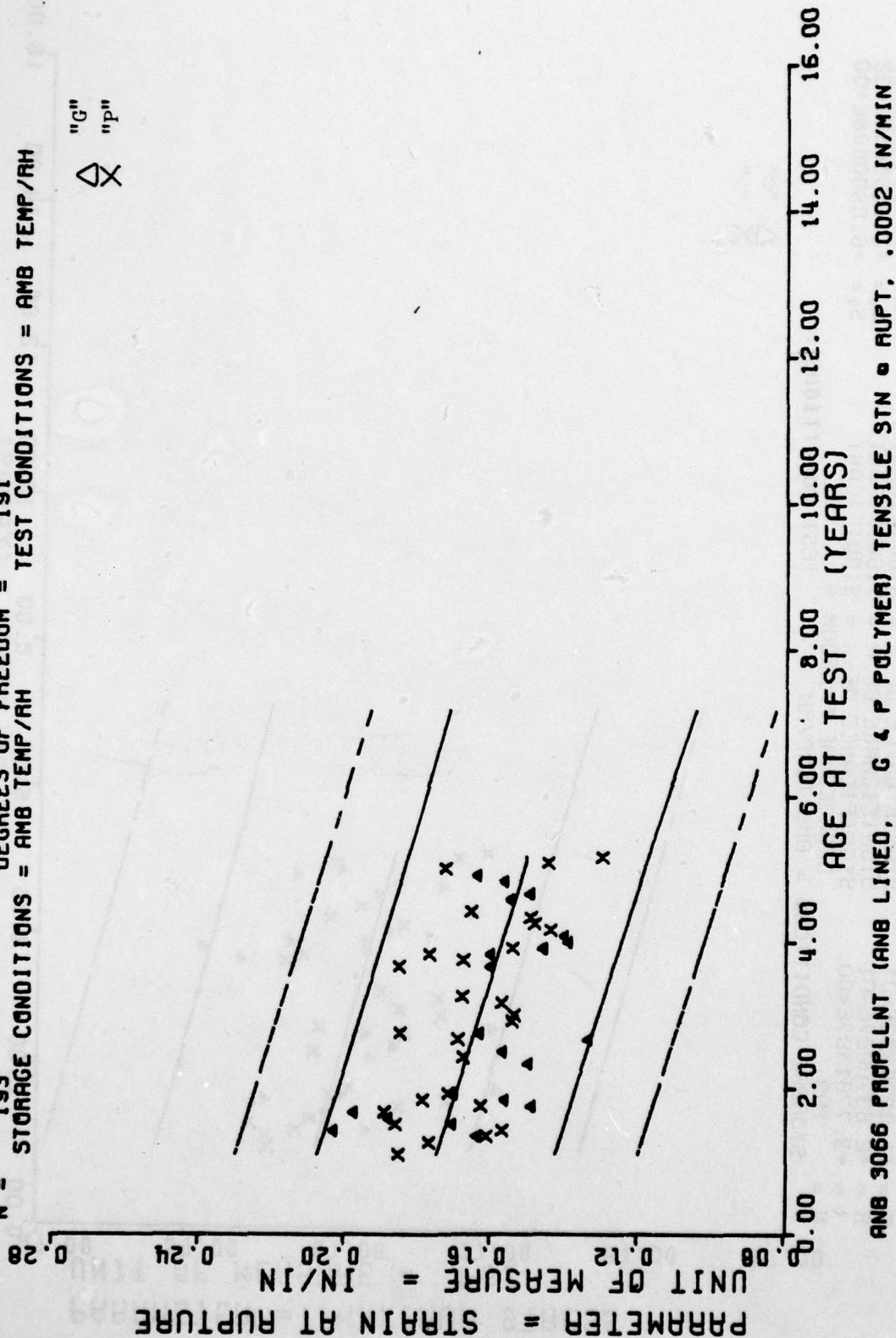


Figure 4-29



$Y = ((+4.3793540E+02) + (+1.4348418E+00) * X)$   
 $F = +1.2869159E+01$  SIGNIFICANCE OF F = SIGNIFICANT  
 $R = +2.5567380E-01$  SIGNIFICANCE OF R = SIGNIFICANT  
 $t = +3.5873610E+00$  SIGNIFICANCE OF t = SIGNIFICANT  
 $N = 186$  DEGREES OF FREEDOM = 184  
 STORAGE CONDITIONS = AMB TEMP/AH  
 TEST CONDITIONS = AMB TEMP/AH  
 $\sigma = +8.5726962E+01$   
 $S_o = +3.9997140E-01$   
 $S_r = +8.3102570E+01$

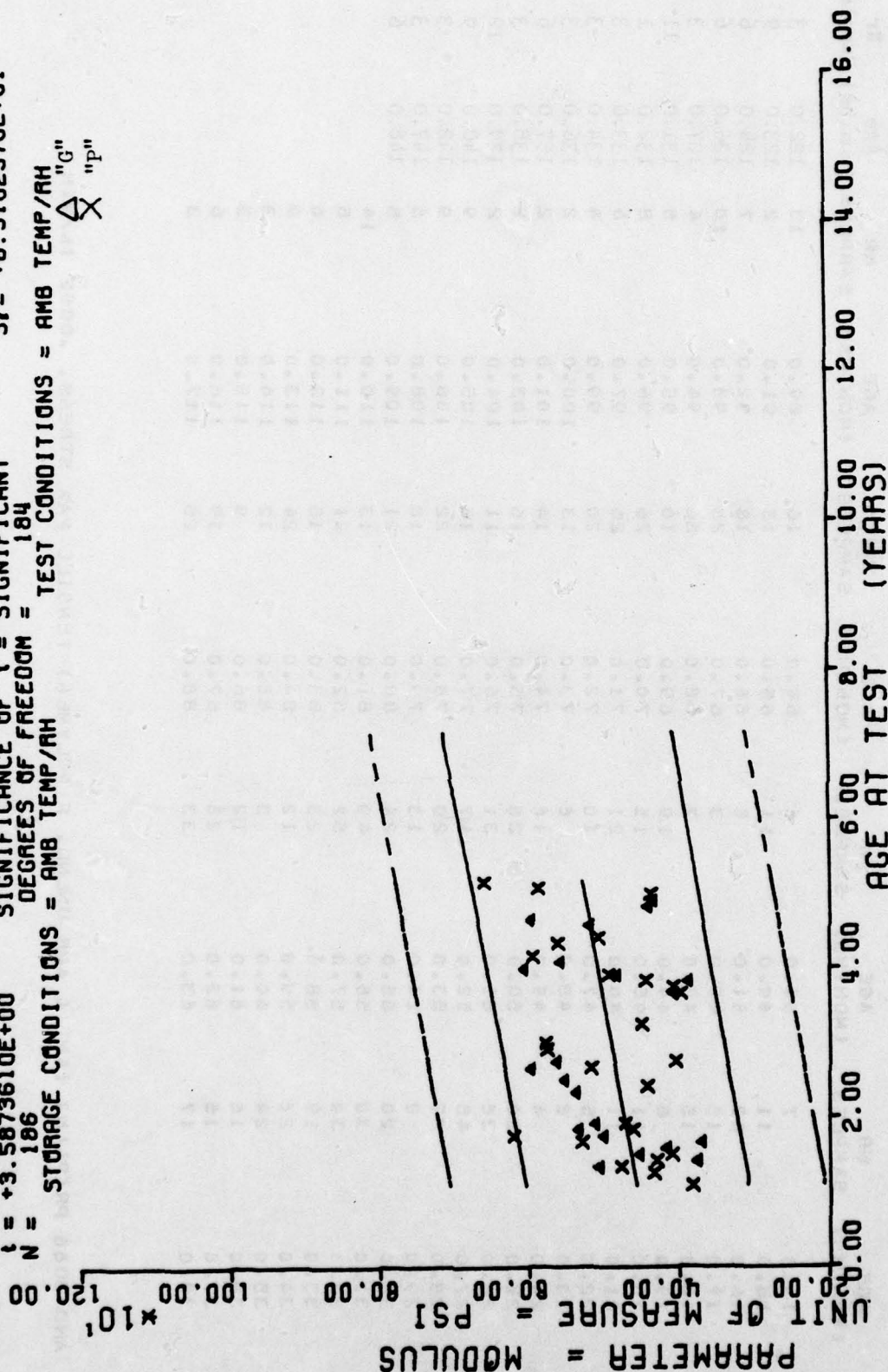


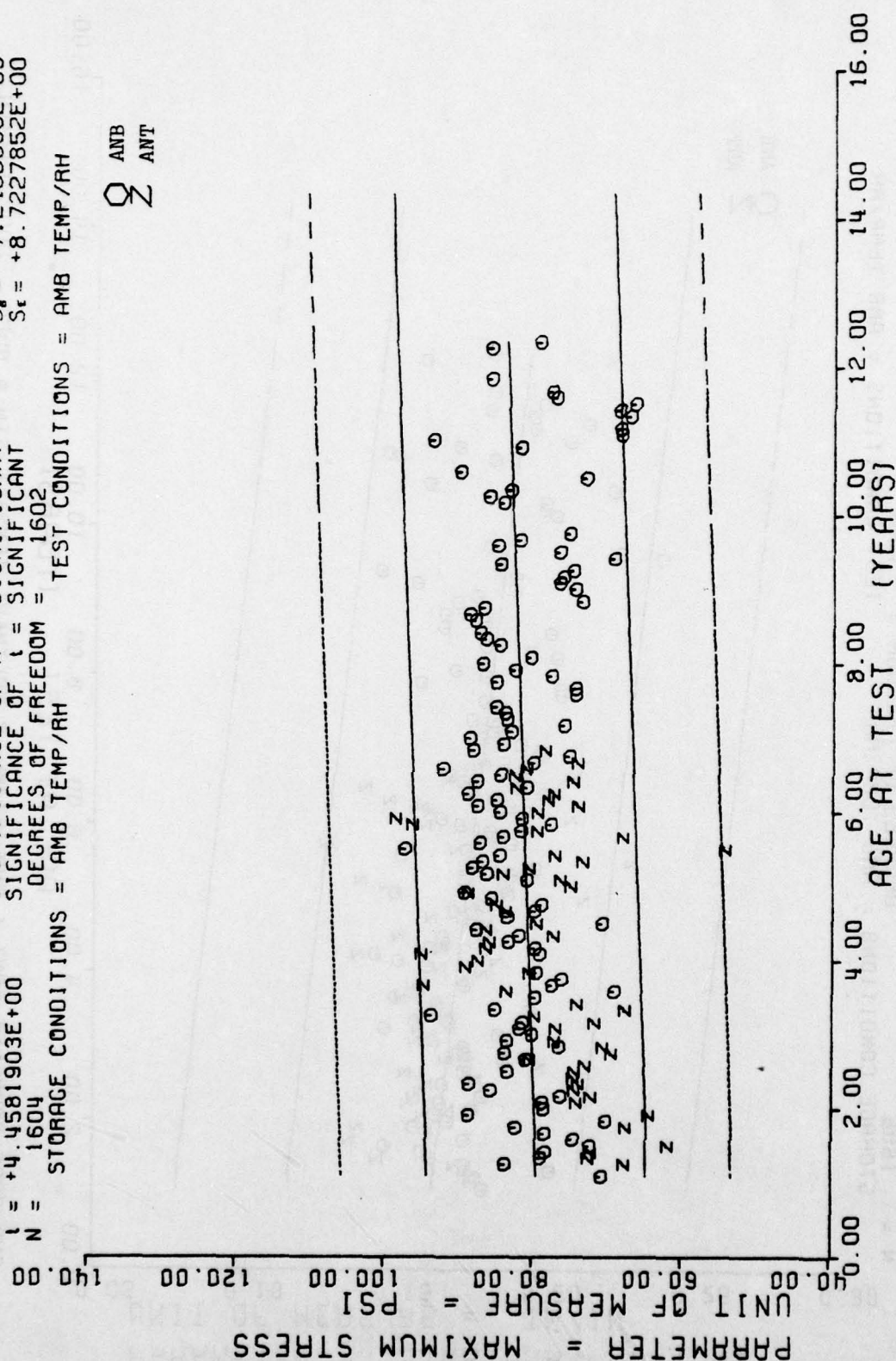
Figure 4-30

AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES
13.0	7	39.0	6	64.0	16	89.0	13	122.0	3		
15.0	11	40.0	11	65.0	13	91.0	2	123.0	9		
16.0	20	41.0	8	66.0	18	92.0	7	124.0	6		
17.0	15	42.0	3	67.0	28	93.0	10	126.0	6		
18.0	15	43.0	7	68.0	26	94.0	4	127.0	3		
19.0	6	44.0	19	69.0	10	95.0	5	131.0	11		
20.0	11	45.0	15	70.0	26	96.0	8	132.0	1		
21.0	11	46.0	21	71.0	26	97.0	6	133.0	3		
22.0	5	47.0	10	72.0	20	99.0	4	134.0	3		
23.0	8	48.0	6	73.0	13	100.0	2	136.0	3		
24.0	4	49.0	16	74.0	14	101.0	2	137.0	6		
25.0	20	50.0	28	75.0	16	103.0	2	138.0	3		
26.0	36	51.0	31	76.0	11	104.0	2	139.0	12		
27.0	45	52.0	17	77.0	15	105.0	9	140.0	9		
28.0	37	53.0	20	78.0	22	106.0	9	142.0	3		
29.0	8	54.0	13	79.0	18	108.0	6	147.0	3		
30.0	20	55.0	24	80.0	21	109.0	5	148.0	6		
31.0	30	56.0	49	81.0	13	110.0	14				
32.0	30	57.0	52	82.0	21	111.0	5				
33.0	19	58.0	23	83.0	15	112.0	6				
34.0	26	59.0	12	84.0	24	113.0	9				
35.0	24	60.0	3	85.0	12	114.0	3				
36.0	16	61.0	12	86.0	9	115.0	3				
37.0	15	62.0	23	87.0	19	116.0	6				
38.0	17	63.0	33	88.0	25	117.0	3				

This sample size summary is applicable to figures 4-31, 4-32 and 4-33

$F = +1.9875461E+01$  SIGNIFICANCE OF F = (+3.2316944E-02) \* X1  
 $R = +1.1070056E-01$  SIGNIFICANCE OF R = SIGNIFICANT  
 $t = +4.4581903E+00$  SIGNIFICANCE OF t = SIGNIFICANT  
 $N = 1604$  DEGREES OF FREEDOM = 1602  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH

ANB  
 Z  
 ANT

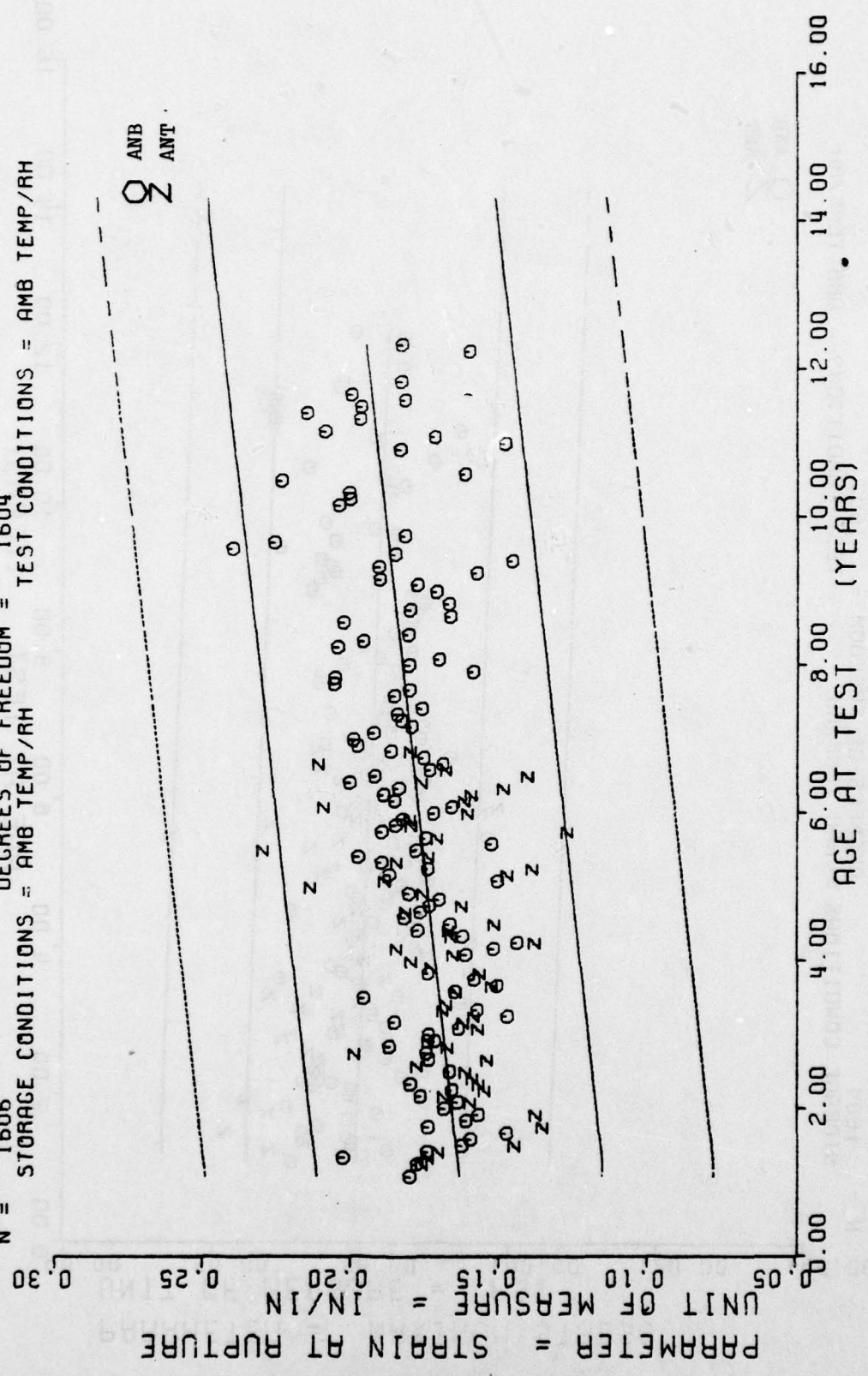


ANB 3066 PROPLANT (ANT & ANB UNLND, P POLYMER) TENSILE MAX STRESS, .0002 IN/MIN

Figure 4-31



$F = +9.4987380E+01$   
 $R = +2.3644921E-01$   
 $l = +9.7461469E+00$   
 $N = 1606$   
 $Y = ((+1.6021245E-01) + (+2.3123023E-04) \times X)$   
 SIGNIFICANCE OF F = SIGNIFICANT  
 SIGNIFICANCE OF R = SIGNIFICANT  
 SIGNIFICANCE OF l = SIGNIFICANT  
 DEGREES OF FREEDOM = 1604  
 STORAGE CONDITIONS = AMB TEMP/RH  
 TEST CONDITIONS = AMB TEMP/RH



ANB  
 Z  
 ANT

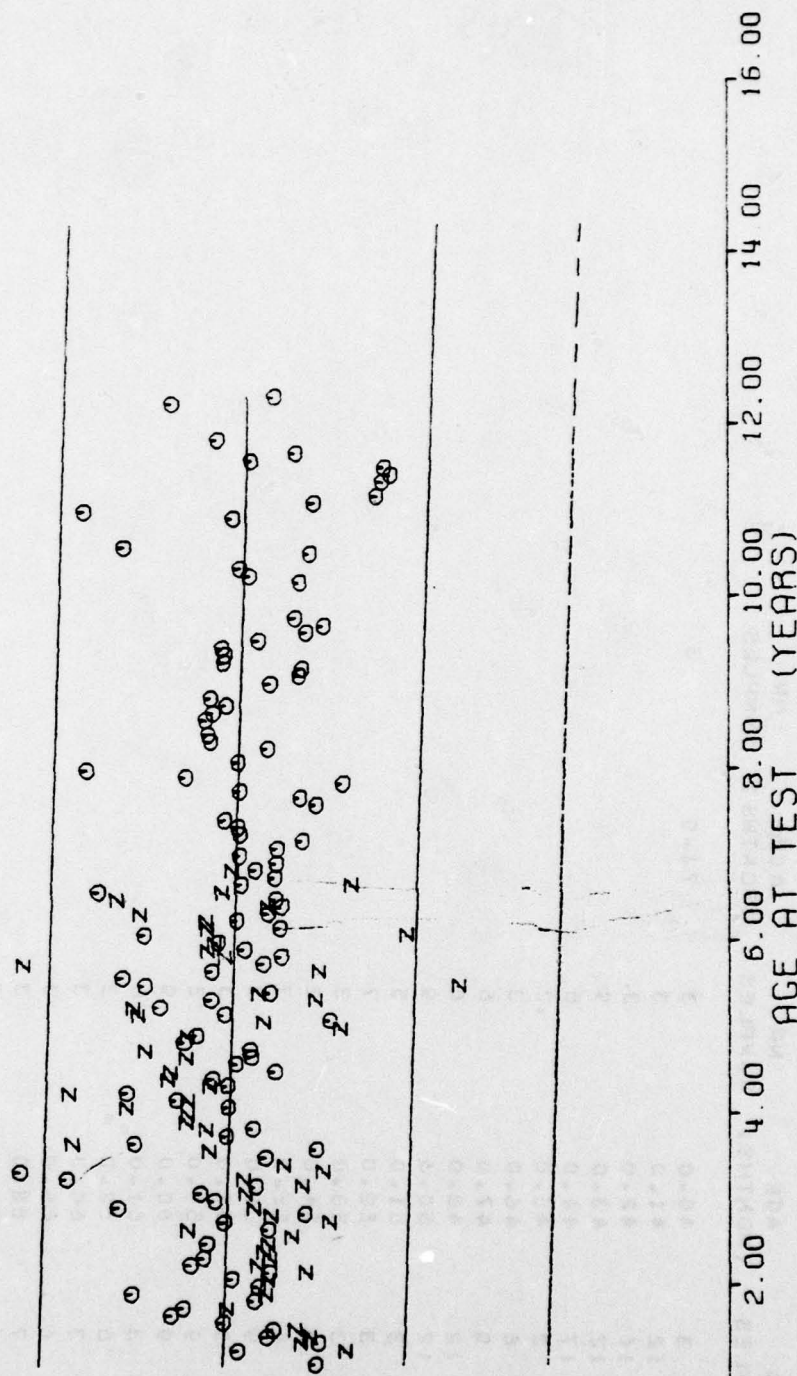
ANB 3066 PROPLNT (ANT & ANB UNLND, P POLYMER) TENSILE SIN • RUPT, .0002 IN/MIN

Figure 4-32

$Y = ((+5.9107497E+02) + (-2.5510843E-01) \times X)$   
 $F = +5.8998262E+00$  SIGNIFICANCE OF F = SIGNIFICANT  
 $R = -6.0555710E-02$  SIGNIFICANCE OF R = SIGNIFICANT  
 $t = +2.4289557E+00$  SIGNIFICANCE OF t = SIGNIFICANT  
 $N = 1605$  DEGREES OF FREEDOM = 1603  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH

PARAMETER = MODULUS  
 UNIT OF MEASURE = PSI  
 \* 10<sup>1</sup>

ANB  
 ANT



ANB 3066 PROPELLANT (ANT & ANB UNLND, P POLYMER) TENSILE MODULUS, .0002 IN/MIN

Figure 4-33

\*\*\* SAMPLE SIZE SUMMARY \*\*\*

AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES
13.0	3	40.0	3	71.0	3
15.0	12	41.0	3		
16.0	16	42.0	3		
17.0	12	43.0	9		
18.0	17	44.0	6		
19.0	3	45.0	3		
20.0	6	46.0	3		
21.0	9	47.0	6		
22.0	12	48.0	6		
23.0	12	50.0	9		
24.0	3	51.0	5		
26.0	3	52.0	7		
27.0	3	53.0	3		
28.0	3	54.0	3		
29.0	6	55.0	3		
30.0	9	56.0	3		
31.0	3	57.0	3		
32.0	9	59.0	3		
33.0	9	60.0	9		
34.0	3	61.0	6		
35.0	6	62.0	3		
36.0	3	64.0	3		
37.0	6	65.0	3		
38.0	7	68.0	3		
39.0	9	70.0	3		

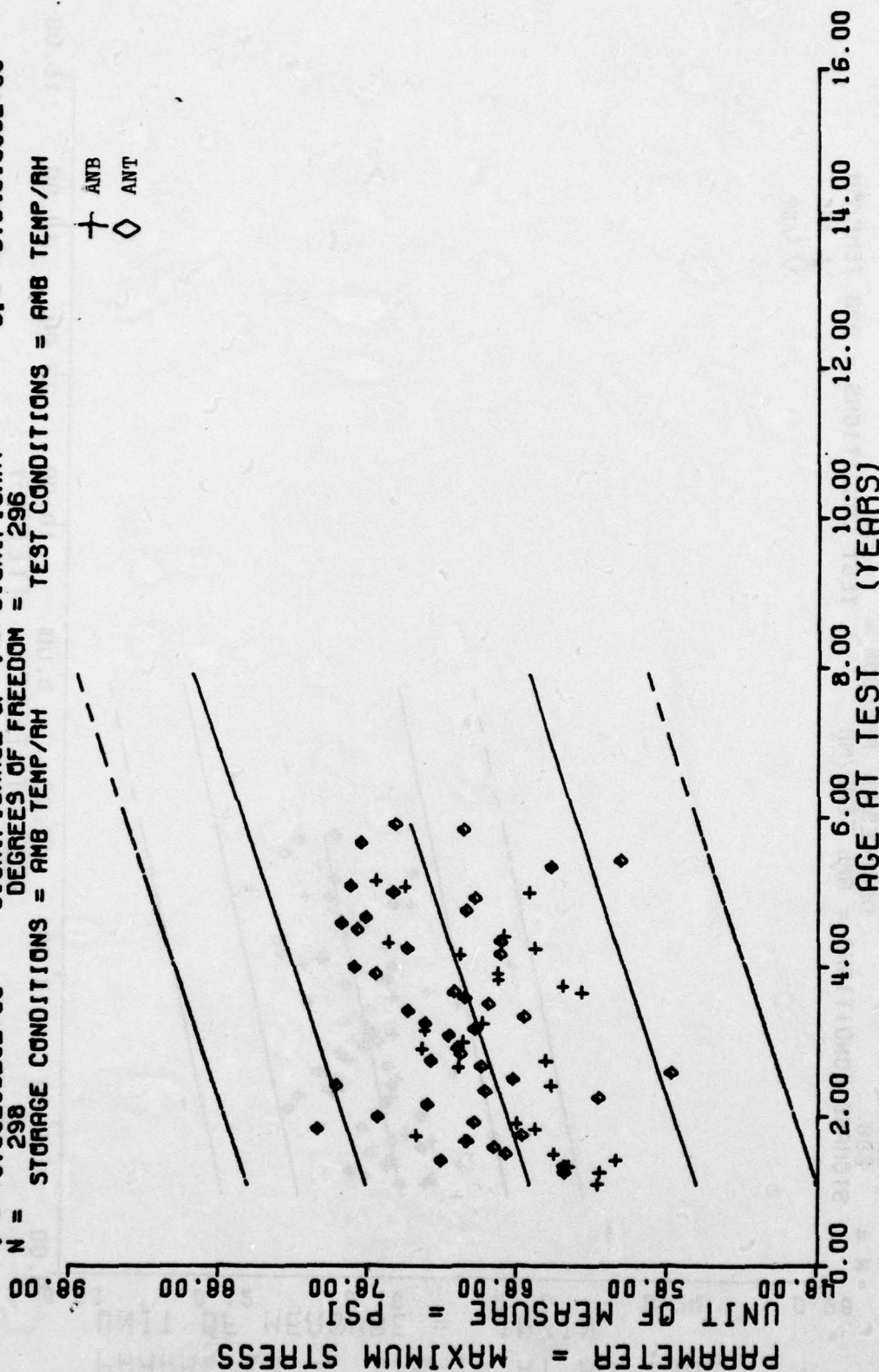
ANB 3066 PROPLNT (ANT 6 ANB LINED, P POLYMER) TENSILE MAX STRESS, .0002 IN/MIN

This sample size summary is applicable to figures 4-34, 4-35 and 4-36



$Y = ((+6.5320870E+01) + (+1.3785270E-01) \times X)$   
 $F = +3.5430852E+01$  SIGNIFICANCE OF F = SIGNIFICANT  
 $R = +3.2695978E-01$  SIGNIFICANCE OF R = SIGNIFICANT  
 $t = +5.9523820E+00$  SIGNIFICANCE OF t = SIGNIFICANT  
 $N = 298$  DEGREES OF FREEDOM = 296  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH

+ ANB  
 ◇ ANT

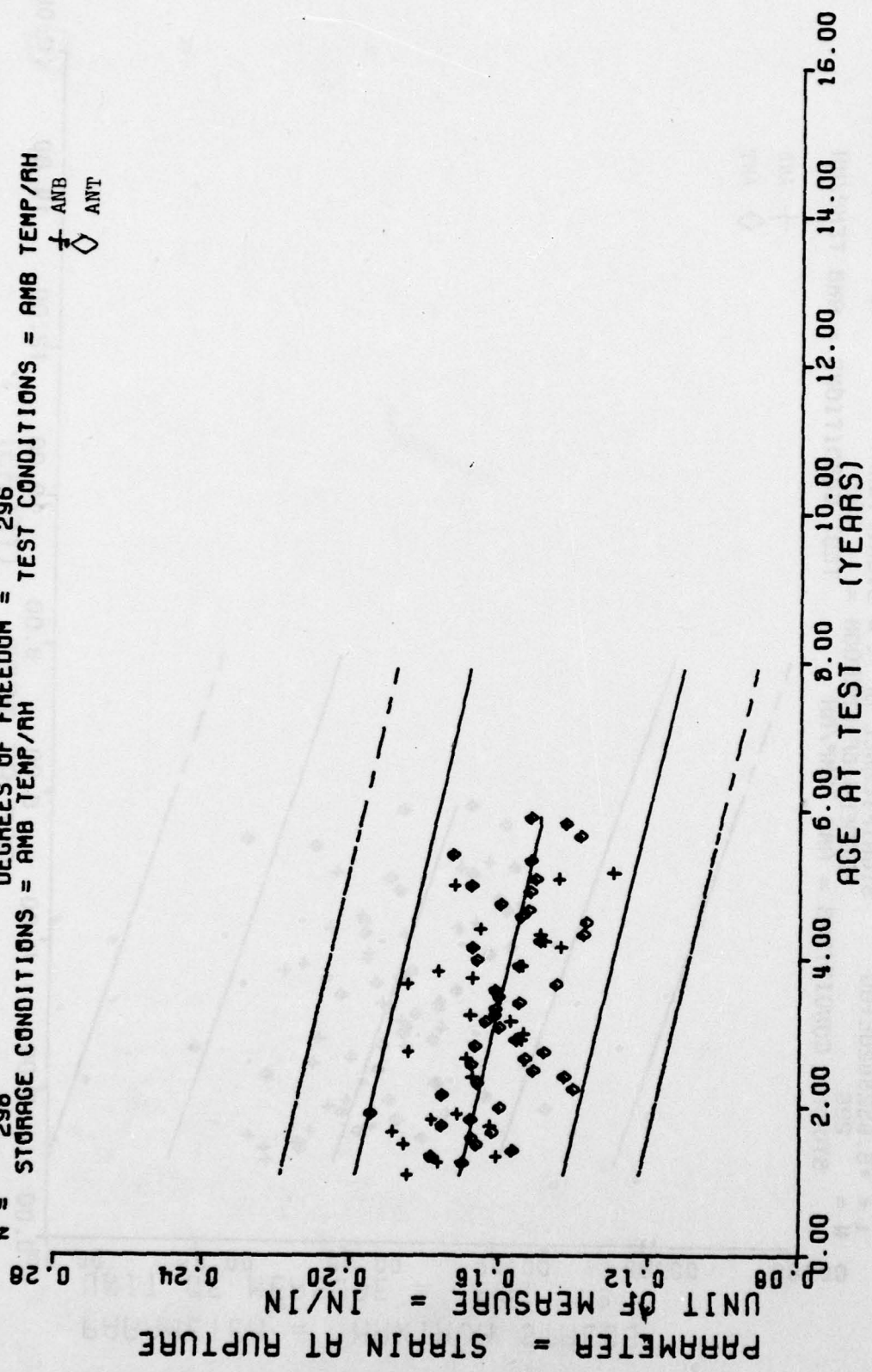


ANB 3066 PROPLANT (ANT & ANB LINED, P POLYMER) TENSILE MAX STRESS, .0002 IN/MIN

Figure 4-34

$Y = ((+1.7605596E-01) + (-3.8349281E-04) \times X)$   
 F = +4.2298431E+01 SIGNIFICANCE OF F = SIGNIFICANT  $\sigma_r = +1.7241892E-02$   
 R = -3.5359890E-01 SIGNIFICANCE OF R = SIGNIFICANT  $S_e = +5.8965108E-05$   
 I = +6.5037244E+00 SIGNIFICANCE OF I = SIGNIFICANT  $S_t = +1.6155231E-02$   
 N = 298 DEGREES OF FREEDOM = 296  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH

+ ANB  
 O ANT



ANB 3066 PROPLANT (ANT & ANB LINED, P POLYMER) TENSILE STN @ RUPT, .0002 IN/MIN

Figure 4-3 5

$Y = ((+4.3940997E+02) + (+2.0269481E+00) \times X)$   
 $F = +5.2415505E+01$  SIGNIFICANCE OF F = SIGNIFICANT  $\sigma_1 = +8.2405282E+01$   
 $R = +3.9124894E-01$  SIGNIFICANCE OF R = SIGNIFICANT  $S_0 = +2.7997081E-01$   
 $t = +7.2398553E+00$  SIGNIFICANCE OF t = SIGNIFICANT  $S_1 = +7.5966975E+01$   
 $N = 292$  DEGREES OF FREEDOM = 290  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH  
 + ANB  
 ◇ ANT

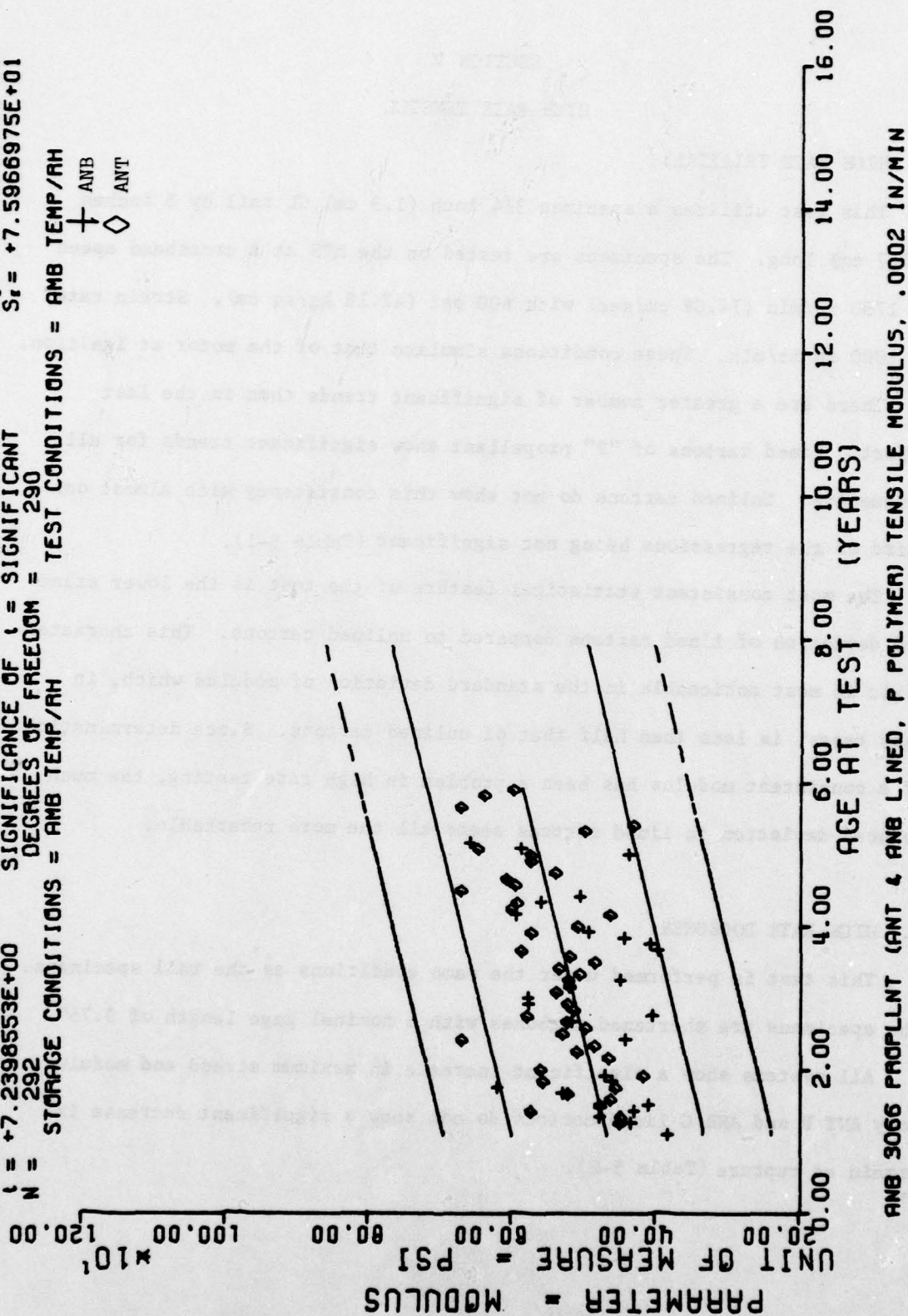


Figure 4-36



SECTION V  
HIGH RATE TENSILE

A. HIGH RATE TRIAXIAL:

This test utilizes a specimen 3/4 inch (1.9 cm) GL rail by 5 inches (12.7 cm) long. The specimens are tested on the MTS at a crosshead speed of 1750 in/min (74.08 cm/sec) with 600 psi (42.18 kg/sq cm). Strain rate is 1000 in/in/min. These conditions simulate that of the motor at ignition.

There are a greater number of significant trends than in the last report. Lined cartons of "P" propellant show significant trends for all parameters. Unlined cartons do not show this consistency with almost one-third of the regressions being not significant (Table 5-1).

The most consistent statistical feature of the test is the lower standard deviation of lined cartons compared to unlined cartons. This characteristic is most noticeable in the standard deviation of modulus which, in many cases, is less than half that of unlined cartons. Since determination of a consistent modulus has been a problem in high rate testing, the much reduced deviation in lined cartons seems all the more remarkable.

B. HIGH RATE DOGBONES:

This test is performed under the same conditions as the rail specimens. The specimens are shortened dogbones with a nominal gage length of 0.75".

All systems show a significant increase in maximum stress and modulus. Only ANT P and ANB G lined cartons do not show a significant decrease in strain at rupture (Table 5-2).

TABLE 5-1

## HIGH RATE TRIAXIAL

## Significance Of Regression Slopes

SYSTEM	Sm	Fig	er	Fig	E	Fig
ANB G Unlined	NS	5-1	Sig inc	5-2	NS	5-3
ANB G Lined	NS	5-4	NS	5-5	Sig inc	5-6
ANB P Unlined	Sig inc	5-7	NS	5-8	Sig dec	5-9
ANB P Lined	Sig inc	5-10	Sig dec	5-11	Sig inc	5-12
ANT P Unlined	Sig inc	5-13	NS	5-14	NS	5-15
ANT P Lined	Sig inc	5-16	Sig dec	5-17	Sig inc	5-18
ANA & ANB G Unlined	NS	5-19	Sig inc	5-20	Sig dec	5-21
ANB G & P Unlined	Sig inc	5-22	Sig inc	5-23	NS	5-24
ANB G & P Lined	Sig inc	5-25	Sig dec	5-26	Sig inc	5-27
ANB & ANT P Unlined	NS	5-28	Sig dec	5-29	NS	5-30
ANB & ANT P Lined	Sig inc	5-31	Sig dec	5-32	Sig inc	5-33

TABLE 5-2

## HIGH RATE DOGBONES

## Significance of Regression Slopes

SYSTEM	Sm	Fig	er	Fig	E	Fig
ANA G Unlined	Sig inc	5-34	Sig dec	5-35	Sig inc	5-36
ANB G Unlined	Sig inc	5-37	Sig dec	5-38	Sig inc	5-39
ANB G Lined	Sig inc	5-40	NS	5-41	Sig inc	5-42
ANB P Unlined	Sig inc	5-43	Sig dec	5-44	Sig inc	5-45
ANB P Lined	Sig inc	5-46	Sig dec	5-47	Sig inc	5-48
ANT P Unlined	Sig inc	5-49	NS	5-50	Sig inc	5-51
ANT P Lined	Sig inc	5-52	NS	5-53	Sig inc	5-54

NS = Not significantly different from zero slope

Sig inc = Positive slope

Sig dec = Negative slope

\*\*\* SAMPLE SIZE SUMMARY \*\*\*

AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP
14	2	89	2
15	2	90	4
16	2	94	4
18	2	95	2
19	2	96	2
20	2		
22	4		
24	2		
25	2		
26	2		
33	2		
43	2		
49	1		
53	3		
54	3		
55	3		
56	6		
59	1		
60	3		
65	6		
70	3		
71	5		
83	3		
85	2		
89	2		

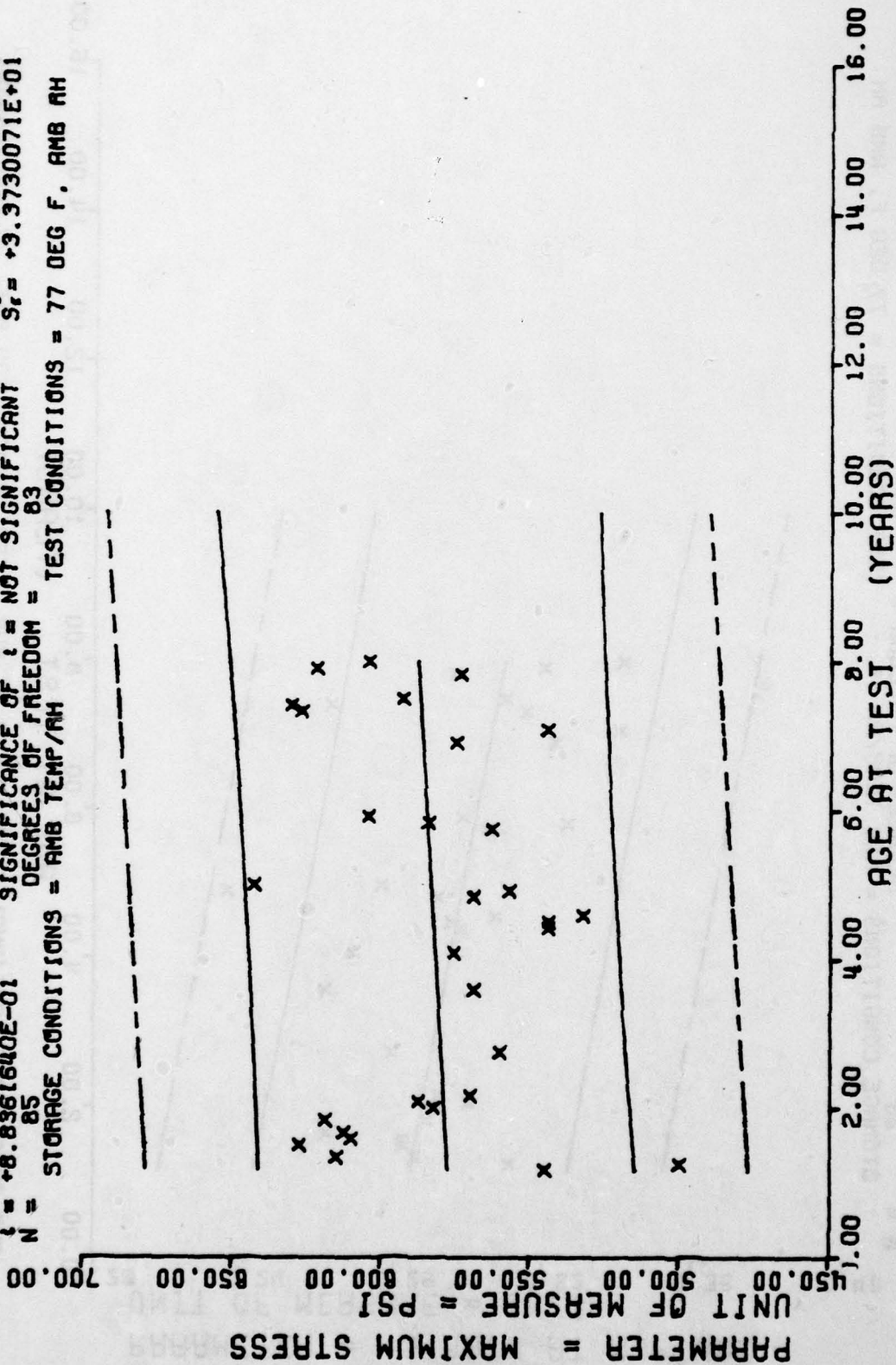
5 - 3

ANP 3066 FRCPELLANT(ANA) TENSILE MAX STRESS. 1750 IN/MIN. 600 PSI. 77 DEG UNLND

This sample size summary is applicable to figures 5-1, 5-2 and 5-3



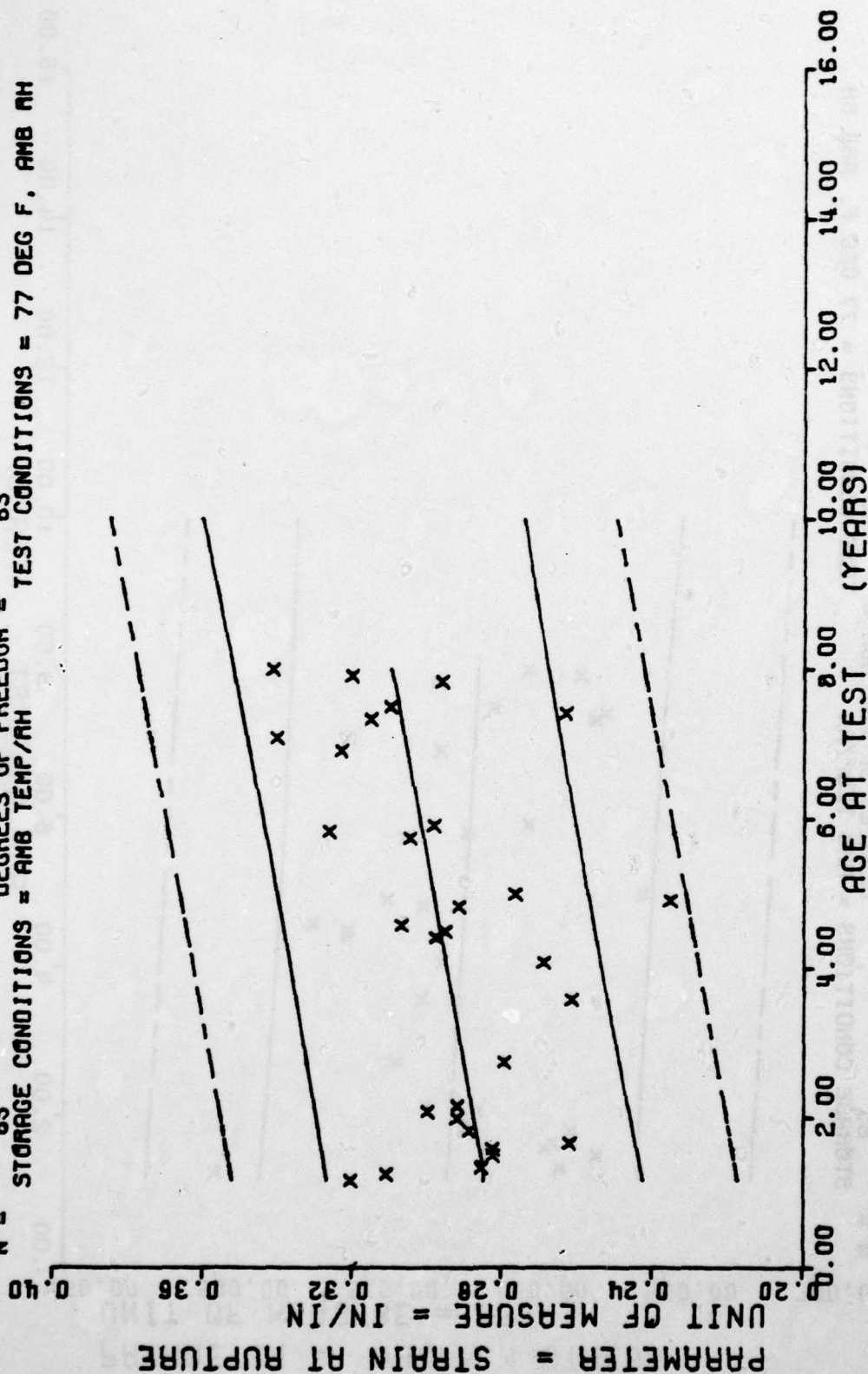
$Y = ((+5.7623300E+02) + (+1.2323501E-01) * X)$   
 $F = +7.8077795E-01$  SIGNIFICANCE OF F = NOT SIGNIFICANT  $\sigma_r = +3.3686028E+01$   
 $R = +9.6536506E-02$  SIGNIFICANCE OF R = NOT SIGNIFICANT  $S_e = +1.3946664E-01$   
 $t = +8.8961640E-01$  SIGNIFICANCE OF t = NOT SIGNIFICANT  $S_r = +3.3730071E+01$   
 $N = 85$  DEGREES OF FREEDOM = 83  
 STORAGE CONDITIONS = AMB TEMP/AH TEST CONDITIONS = 77 DEG F, AMB RH



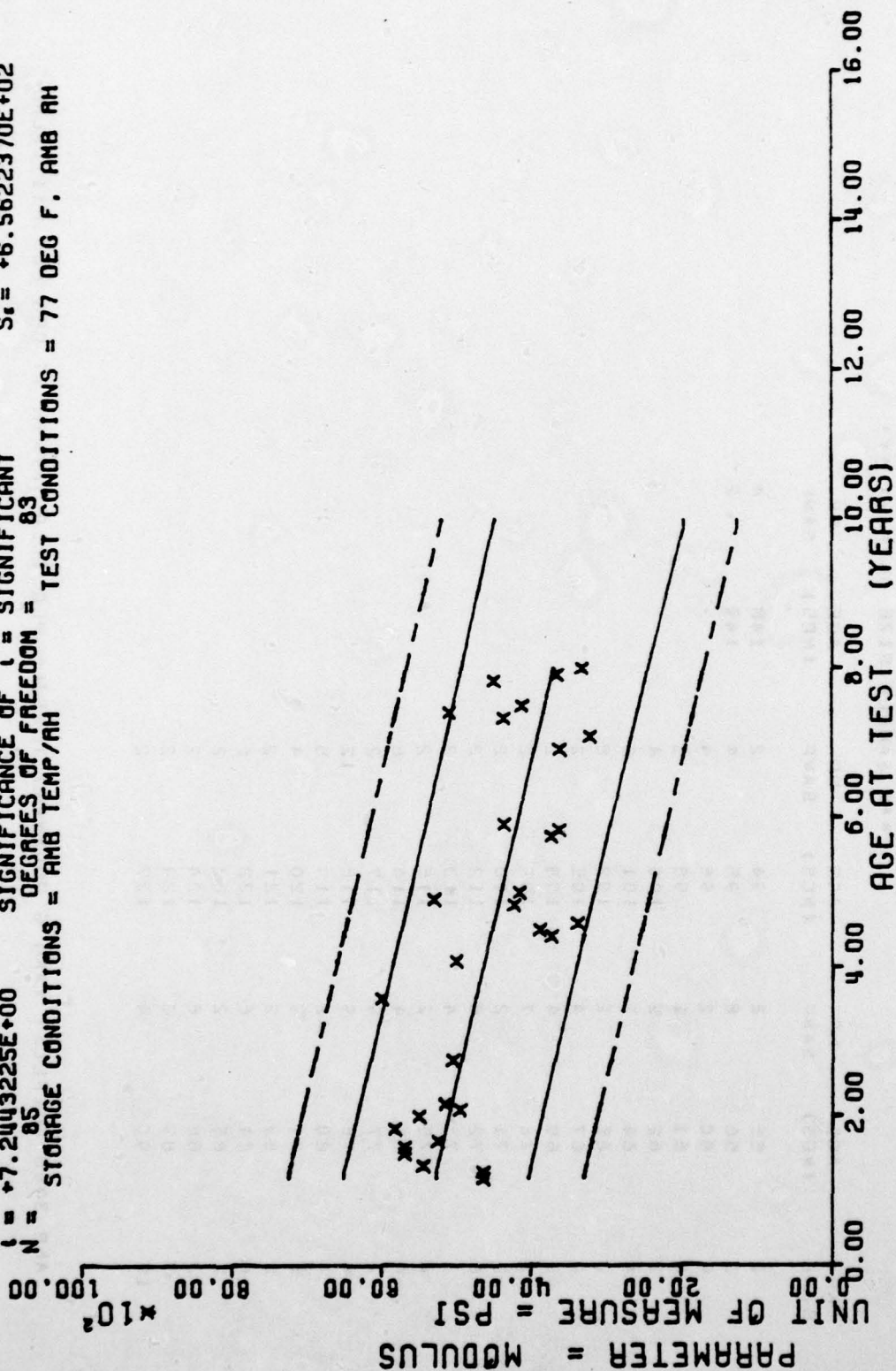
ANB 3066 PROPELLANT (ANA) TENSILE MAX STRESS, 1750 IN/MIN, 600 PSI, 77 DEG UNLND

Figure 5-1

$Y = ((+2.8045349E-01) + (+3.0419969E-04) \cdot X)$   
 $F = +1.0641952E+01$  SIGNIFICANCE OF F = SIGNIFICANT  $\alpha = +2.3811712E-02$   
 $R = +3.3711293E-01$  SIGNIFICANCE OF R = SIGNIFICANT  $S_e = +9.3249845E-05$   
 $t = +3.2622005E+00$  SIGNIFICANCE OF t = SIGNIFICANT  $S_1 = +2.2552518E-02$   
 $N = 85$  DEGREES OF FREEDOM = 83  
 STORAGE CONDITIONS = AMB TEMP/AH TEST CONDITIONS = 77 DEG F, AMB RH



$Y = ((+5.5651929E+03) + (-1.9656345E+01) \times X)$   
 $F = +5.2480208E+01$  SIGNIFICANCE OF F = SIGNIFICANT  $\sigma_f = +8.3339367E+02$   
 $R = -6.2238604E-01$  SIGNIFICANCE OF R = SIGNIFICANT  $S_e = +2.7133448E+00$   
 $t = +7.2443225E+00$  SIGNIFICANCE OF t = SIGNIFICANT  $S_e = +6.5622370E+02$   
 $N = 85$  DEGREES OF FREEDOM = 83  
 STORAGE CONDITIONS = AMB TEMP/AH TEST CONDITIONS = 77 DEG F, AMB AH



ANB 3066 PROPELLANT (ANA) TENSILE MODULUS, 1750 IN/MIN, 600 PSI, 77 DEG UNLND

Figure 5-3



\*\*\* SAMPLE SIZE SUMMARY \*\*\*

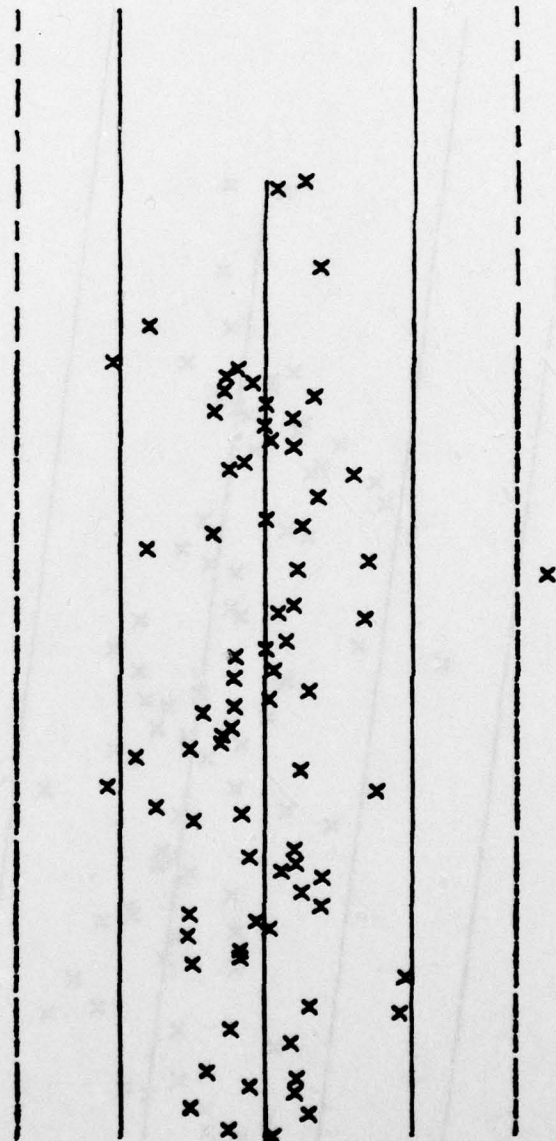
AGE (MCS)	NR SAME	AGE (MCS)	NR SAME	AGE (MCS)	NR SAME	AGE (MCS)	NR SAME
16	2	55	8	94	2	148	0
17	2	56	8	95	4	149	2
18	4	57	2	96	4		
19	2	58	2	97	3		
20	2	59	2	98	4		
21	2	60	2	99	4		
22	4	61	2	100	2		
23	2	62	2	101	2		
24	2	63	2	102	2		
25	2	64	4	103	2		
26	2	65	4	104	2		
27	2	66	4	105	2		
28	2	67	7	106	2		
29	2	68	2	107	2		
30	2	69	2	108	2		
31	2	70	2	109	2		
32	2	71	2	110	2		
33	6	72	2	111	2		
34	1	73	4	112	2		
35	4	74	2	113	2		
36	4	75	2	114	2		
37	4	76	4	115	6		
38	2	77	5	116	2		
39	4	78	5	117	12		
40	4	79	5	118	5		
41	5	80	2	119	4		
42	5	81	5	120	2		
43	2	82	2	121	2		
44	4	83	6	122	6		
45	2	84	2	123	2		
46	3	85	6	124	2		
47	7	86	3	125	2		
48	15	87	4	126	2		
49		88		127			
50		89		128			
51		90		129			
52				130			
53				131			
54				132			

ANE 3066 FRCFLINT (ANR G POLYMER) TENSILE MDC 1750 IN/MIN 77 DEG 600 PSI UNLND

This sample size summary is applicable to figures 5-4, 5-5 and 5-6

$Y = ((+5.7110229E+02) + (-3.6171318E-02) * X)$   
 $F = +2.6349516E-01$  SIGNIFICANCE OF F = NOT SIGNIFICANT  $\sigma^2 = +3.8450912E+01$   
 $R = -2.9772515E-02$  SIGNIFICANCE OF R = NOT SIGNIFICANT  $S_e = +7.0465740E-02$   
 $t = +5.1331779E-01$  SIGNIFICANCE OF t = NOT SIGNIFICANT  $S_1 = +3.8498516E+01$   
 $N = 298$  DEGREES OF FREEDOM = 297  
 STORAGE CONDITIONS = AMB TEMP/AH TEST CONDITIONS = 77 DEG F, AMB RH

PARAMETER = MAXIMUM STRESS  
 UNIT OF MEASURE = PSI  
 400.00  
 480.00  
 560.00  
 640.00  
 720.00  
 800.00

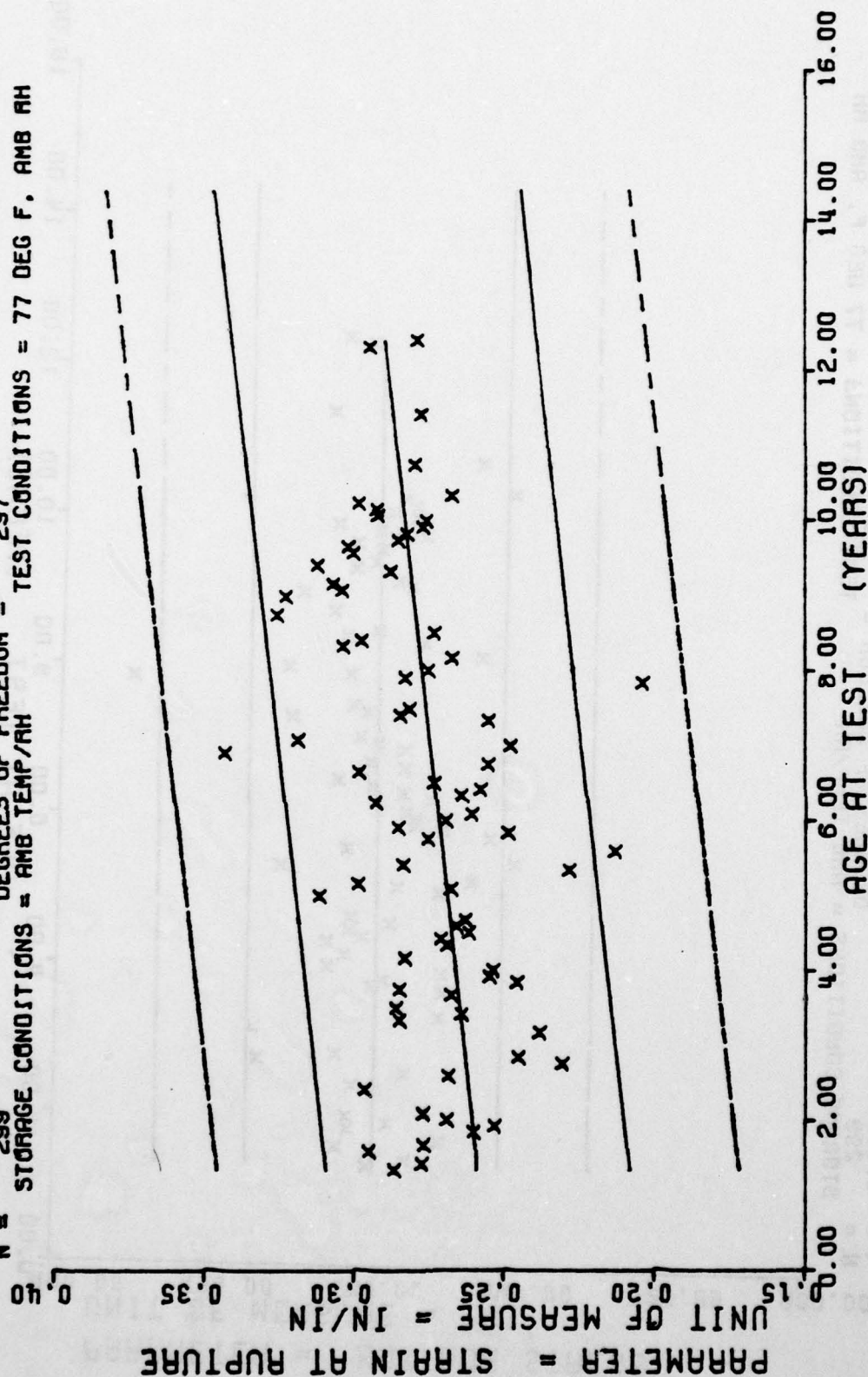


AGE AT TEST (YEARS)  
 0.00 2.00 4.00 6.00 8.00 10.00 12.00 14.00 16.00

ANB 3066 PROPELLANT (ANB G POLYMER) TENSILE SM, 1750 IN/MIN, 600 PSI, 77 DEG UNLO

Figure 5-4

$Y = ((+2.5515170E-01) + (+2.2997430E-04) * X)$   
 $F = +1.87093325E+01$  SIGNIFICANCE OF F = SIGNIFICANT  $G = +2.9903175E-02$   
 $A = +2.4339859E-01$  SIGNIFICANCE OF A = SIGNIFICANT  $S_0 = +5.3176517E-05$   
 $L = +4.3247342E+00$  SIGNIFICANCE OF L = SIGNIFICANT  $S_1 = +2.9052657E-02$   
 $N = 299$  DEGREES OF FREEDOM = 297  
 STORAGE CONDITIONS = AMB TEMP/AH TEST CONDITIONS = 77 DEG F, AMB RH

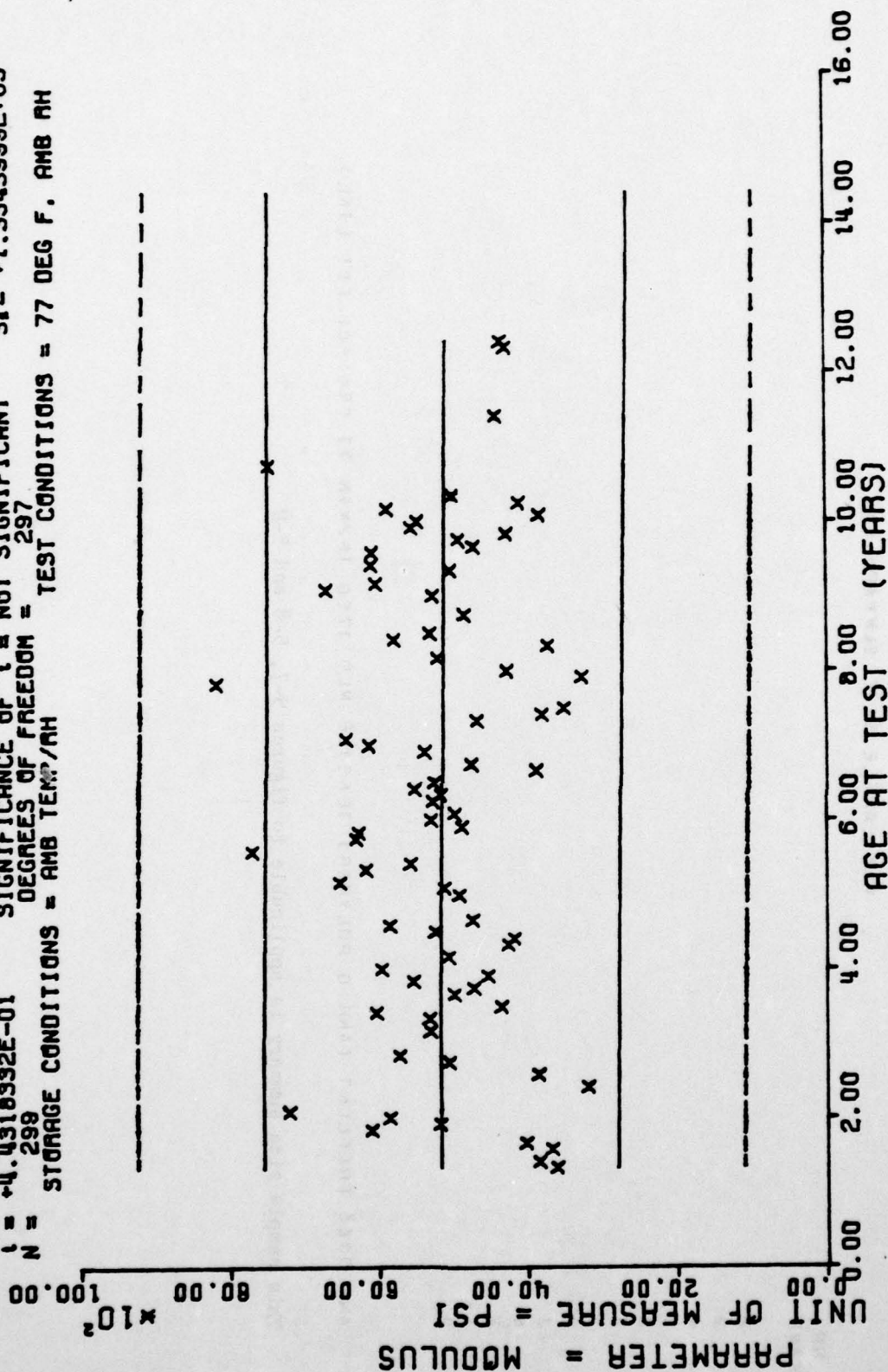


AMB 3066 PROPLANT (AMB G POLYMER) TENSILE EA, 1750 IN/MIN, 600 PSI, 77 DEG UNLD

Figure 5-5



$$Y = ((+5.1997865E+03) + (-1.0986626E+00) * X)$$
  
 $F = +1.9641145E-01$  SIGNIFICANCE OF F = NOT SIGNIFICANT  $G_1 = +1.3525725E+03$   
 $R = -2.5707605E-02$  SIGNIFICANCE OF R = NOT SIGNIFICANT  $S_1 = +2.4790252E+00$   
 $t = +4.4318392E-01$  SIGNIFICANCE OF t = NOT SIGNIFICANT  $S_2 = +1.3543999E+03$   
 $N = 299$  DEGREES OF FREEDOM = 297  
 STORAGE CONDITIONS = AMB TEMP/AM TEST CONDITIONS = 77 DEG F. AMB RH



AMB 3066 PROPLANT (AMB G POLYMER) TENSILE MOD 1750 IN/MIN 77 DEG 600 PSI UNLND

Figure 5-6

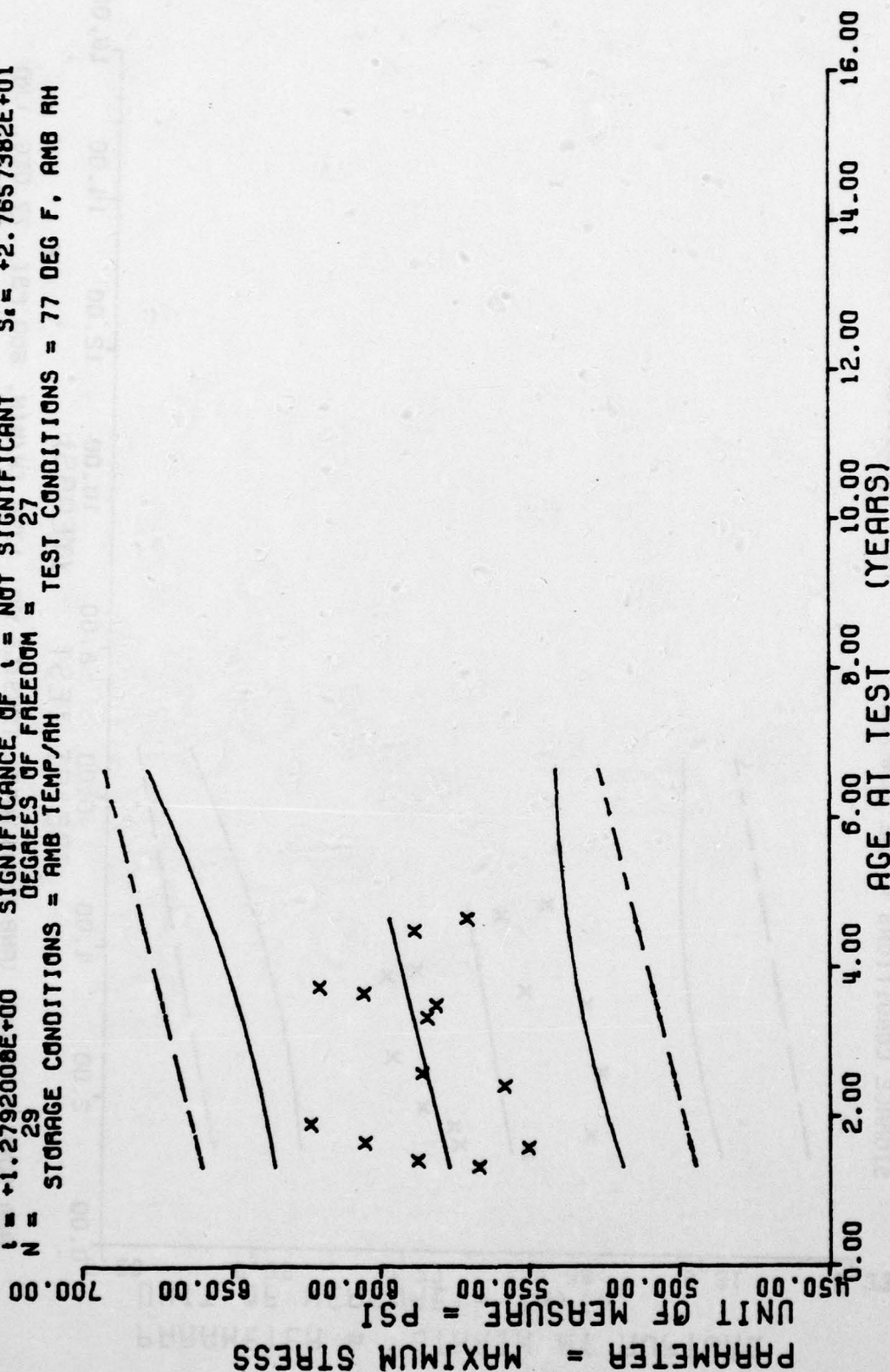
\*\*\* SAMPLE SIZE SUMMARY \*\*\*

AGE (MCS)	NR SAMP
16	2
17	2
18	4
20	2
23	2
25	2
31	2
40	2
42	2
44	4
45	2
54	1
56	2

ANB 3065 PRFLPLNT (ANB G POLYMER) TENSILE MCD 1750 IN/WIN 77 DEG 500 PSI LINED

This sample size summary is applicable to figures 5-7, 5-8 and 5-9

$F = +1.6363548E+00$  SIGNIFICANCE OF F = ( +5.691788E+02 ) + ( +5.0148561E-01 ) \* X)  
 $A = +2.3904511E-01$  SIGNIFICANCE OF A = NOT SIGNIFICANT  $\sigma_r = +2.7969900E+01$   
 $t = +1.2792008E+00$  SIGNIFICANCE OF t = NOT SIGNIFICANT  $S_e = +3.9203038E-01$   
 $N = 29$  DEGREES OF FREEDOM = 27  $S_e = +2.7657382E+01$   
 STORAGE CONDITIONS = AMB TEMP/AH TEST CONDITIONS = 77 DEG F, AMB RH

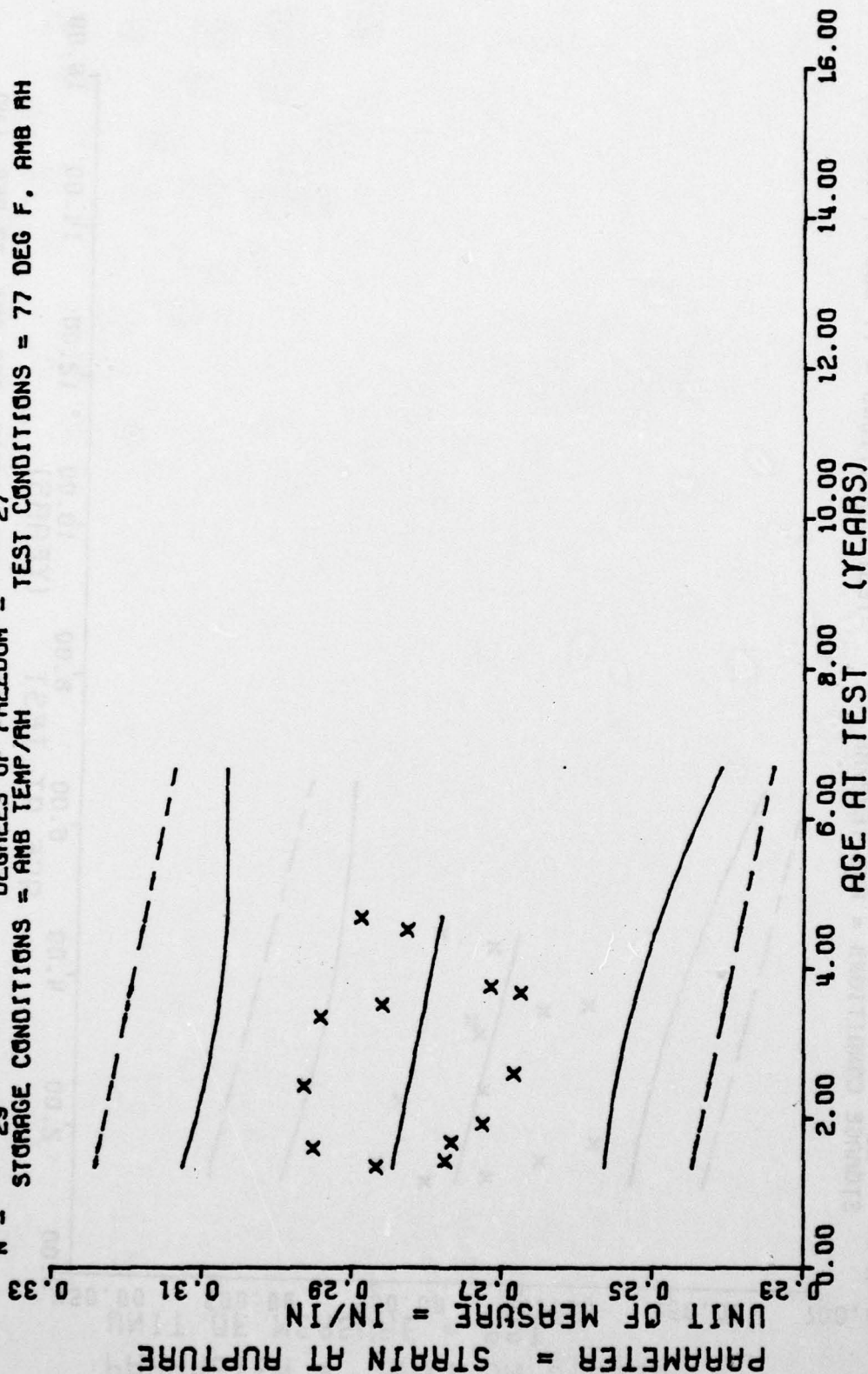


ANB 3066 PROPELLANT (ANB G POLYMER) TENSILE SM, 1750 IN/MIN, 600 PSI, 77 DEG, LND

Figure 5-7



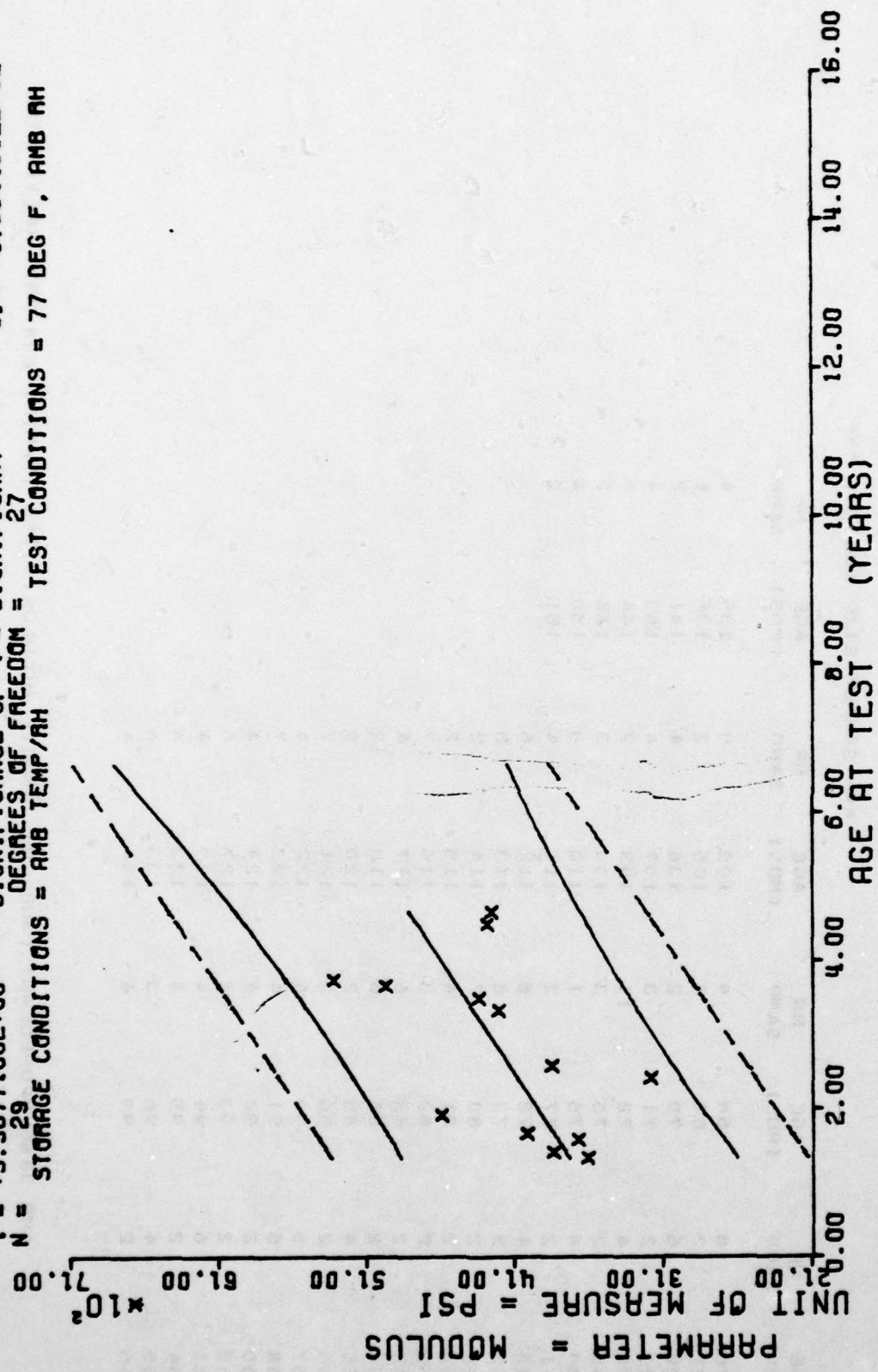
$Y = ((+2.8718580E-01) + (-1.6841995E-04) * X)$   
 $F = +8.0051362E-01$  SIGNIFICANCE OF F = NOT SIGNIFICANT  $Q_1 = +1.3232683E-02$   
 $R = -1.6969066E-01$  SIGNIFICANCE OF R = NOT SIGNIFICANT  $S_1 = +1.8823882E-04$   
 $t = +8.9471426E-01$  SIGNIFICANCE OF t = NOT SIGNIFICANT  $S_2 = +1.3280075E-02$   
 $N = 29$  DEGREES OF FREEDOM = 27  
 STORAGE CONDITIONS = AMB TEMP/AH TEST CONDITIONS = 77 DEG F, AMB RH



AMB 3066 PROPLANT (AMB G POLYMER) TENSILE EA, 1750 IN/MIN, 600 PSI, 77 DEG, LND

Figure 5-8

$Y = ((+3.3037094E+03) + (+2.7077782E+01) * X)$   
 $F = +1.2728554E+01$  SIGNIFICANCE OF F = SIGNIFICANT  
 $A = +5.6602832E-01$  SIGNIFICANCE OF A = SIGNIFICANT  
 $I = +3.5677100E+00$  SIGNIFICANCE OF I = SIGNIFICANT  
 $N = 29$  DEGREES OF FREEDOM = 27  
 STORAGE CONDITIONS = AMB TEMP/AH TEST CONDITIONS = 77 DEG F, AMB RH



ANB 3066 PROPLANT (ANB G POLYMER) TENSILE MOD 1750 IN/MIN 77 DEG 600 PSI LINED

Figure 5-9

\*\*\* SAMPLE SIZE SUMMARY \*\*\*

AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP
16	8	68	4	100	8	135	4
21	2	69	8	105	2	136	6
28	6	70	2	106	4	141	2
29	2	71	3	107	4	143	4
30	4	72	11	108	2	144	8
36	2	75	3	109	3	145	2
39	4	76	1	110	8	150	4
41	2	77	2	111	4	151	2
43	4	78	6	112	6		
46	2	79	2	113	5		
49	2	80	7	114	2		
50	2	81	4	115	2		
52	2	82	3	116	2		
53	2	83	6	117	4		
54	2	84	6	118	2		
55	4	85	2	120	2		
56	2	86	2	121	2		
57	6	90	6	122	4		
58	5	91	4	123	7		
60	2	92	4	124	4		
62	2	93	2	127	6		
63	6	94	4	129	4		
64	2	95	4	132	4		
65	4	96	3	133	4		
66	2	99	4	134	4		

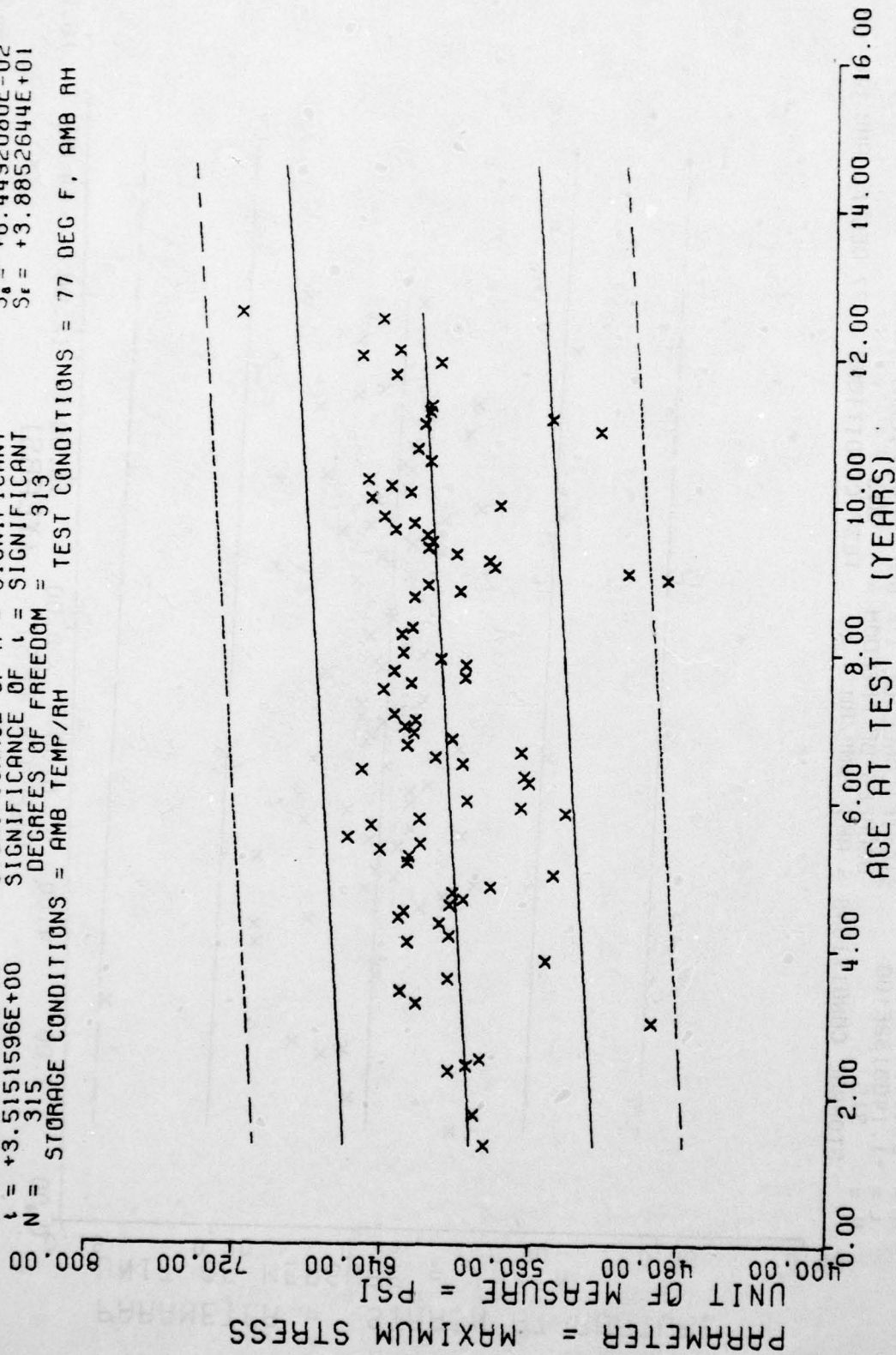
ANR 3066 PROPELLANT (ANR, P) TENSILE MODULUS, 1750 IN/MIN, 600 PSI, UNILAD CTNS

HR Triaxial

This sample size summary is applicable to figures 5-10, 5-11 and 5-12



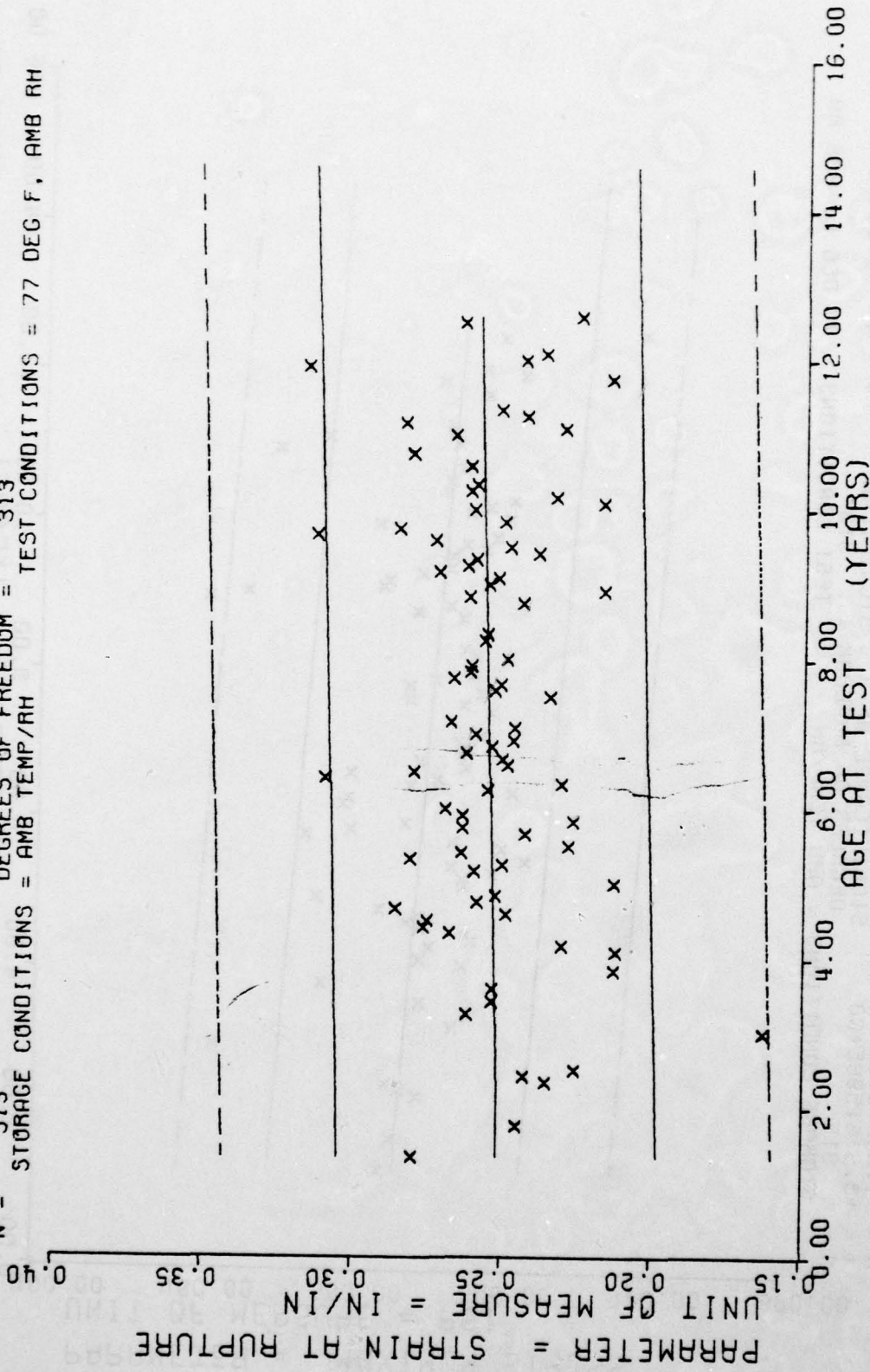
$F = +1.2356347E+01$   
 $R = +1.9487916E-01$   
 $t = +3.5151596E+00$   
 $N = 315$   
 STORAGE CONDITIONS = AMB TEMP/RH  
 DEGREES OF FREEDOM = 313  
 $Y = ((+5.8943753E+02) + (+2.2669995E-01) \times X)$   
 SIGNIFICANCE OF F = SIGNIFICANT  
 SIGNIFICANCE OF R = SIGNIFICANT  
 SIGNIFICANCE OF t = SIGNIFICANT  
 $S_e = +3.8852644E+01$   
 $S_a = +6.4492080E-02$   
 $S_v = +3.9548990E+01$   
 TEST CONDITIONS = 77 DEG F, AMB RH



ANB 3066 PROPELLANT (ANB P) TENSILE MAX STRESS, 1750 IN/MIN, 600 PSI UNLND CTNSHR TRIAX

Figure 5-10

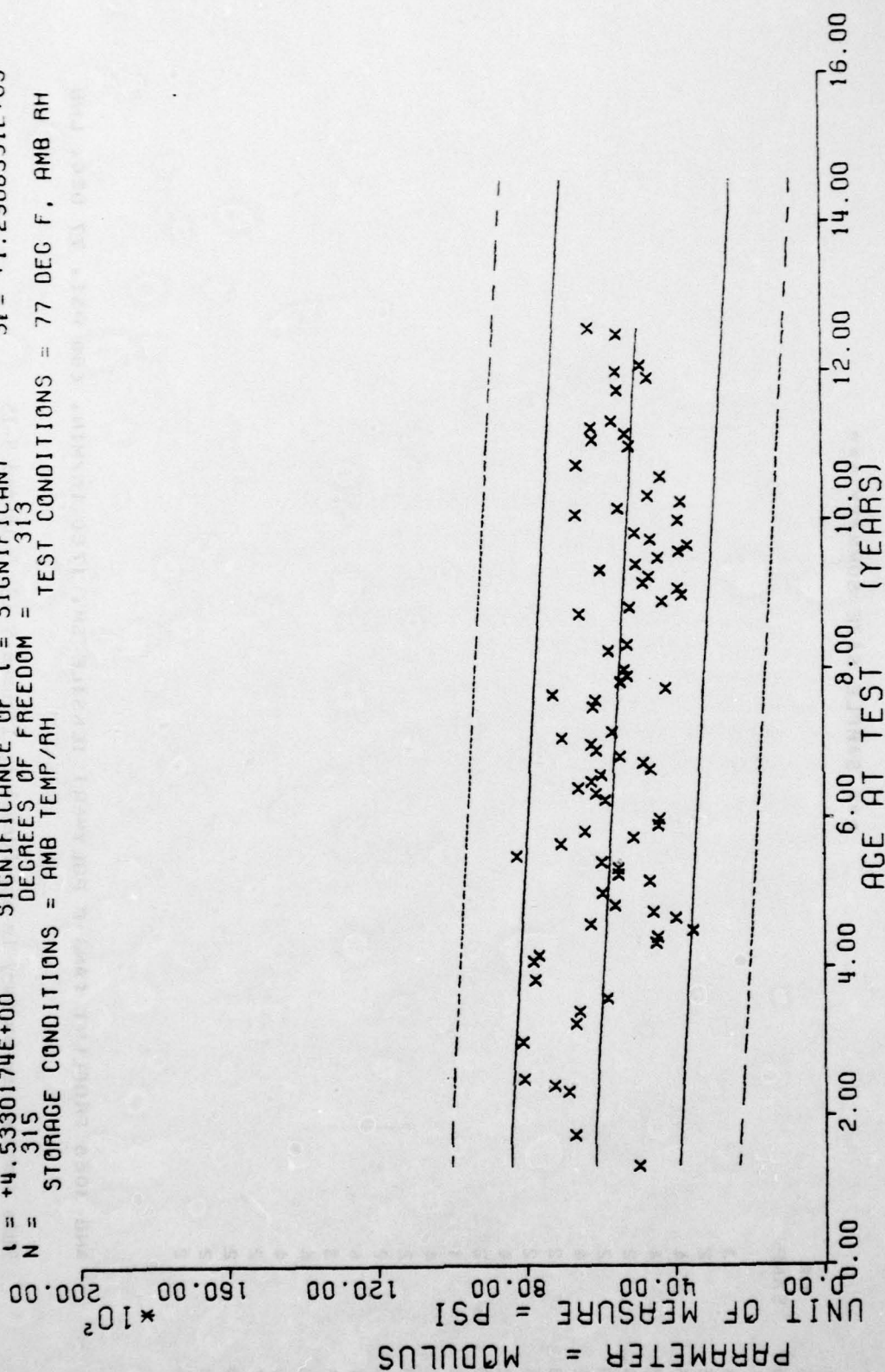
$Y = ((+2.5054392E-01) + (+5.8060954E-05) * X)$   
 $F = +1.3014548E+00$  SIGNIFICANCE OF F = NOT SIGNIFICANT  $G_1 = +3.0675537E-02$   
 $R = +6.4348933E-02$  SIGNIFICANCE OF R = NOT SIGNIFICANT  $S_0 = +5.0894355E-05$   
 $t = +1.1408132E+00$  SIGNIFICANCE OF t = NOT SIGNIFICANT  $S_r = +3.0660823E-02$   
 $N = 315$  DEGREES OF FREEDOM = 313  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 77 DEG F, AMB RH



ANB 3066 PROPELLANT (AMB, P) TENSILE STN @ RUPT, 1750 IN/MIN, 600 PSI, UNLND CT HR Triax

Figure 5-11

$Y = ((+6.3459875E+03) + (-9.7112845E+00) * X)$   
 $F = +2.0548246E+01$  SIGNIFICANCE OF F = SIGNIFICANT  
 $R = -2.4820358E-01$  SIGNIFICANCE OF R = SIGNIFICANT  
 $L = +4.5330174E+00$  SIGNIFICANCE OF L = SIGNIFICANT  
 $N = 315$  DEGREES OF FREEDOM = 313  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 77 DEG F, AMB RH



ANB 3066 PROPELLANT (ANB, P) TENSILE MODULUS, 1750 IN/MIN, 600 PSI, UNLND CTNS HR Triax

Figure 5- 12



AD-A080 581

OGDEN AIR LOGISTICS CENTER HILL AFB UT PROPELLANT LAB--ETC F/G 21/9.2  
PROPELLANT SURVEILLANCE REPORT ANB-3066 PROPELLANT.(U)  
NOV 79 E M DALABA

UNCLASSIFIED

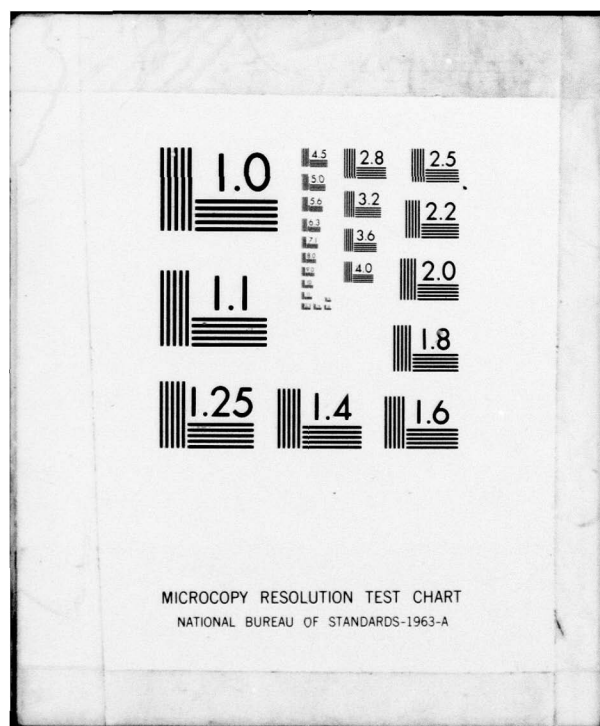
MANCP-417(79)

NL

2 OF 5

AD  
A080581





\*\*\* SAMPLE SIZE SUMMARY \*\*\*

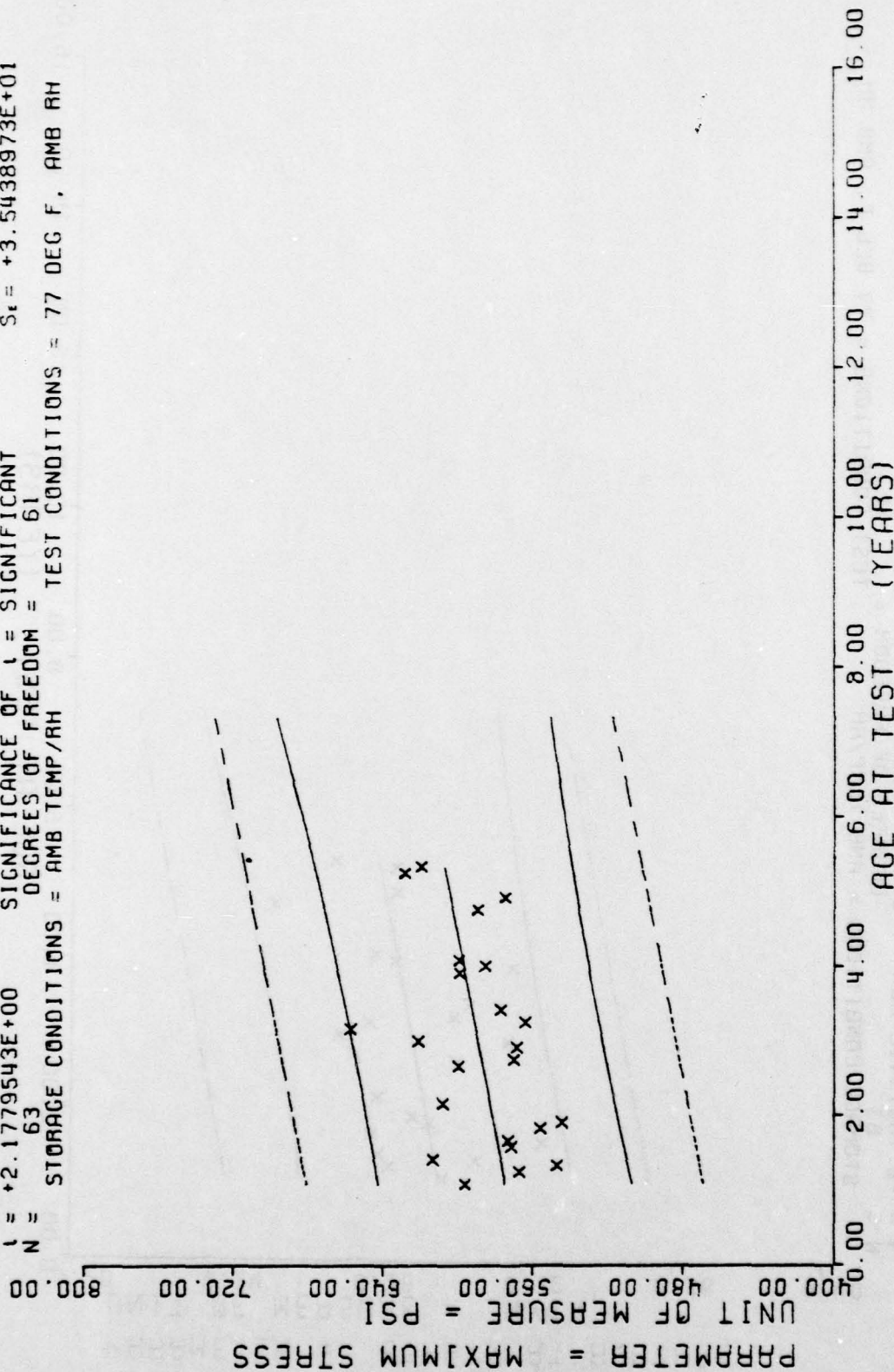
AGE (MOS)	NR SAMP
13	3
15	2
16	4
17	4
19	2
20	2
22	4
23	2
26	2
32	4
33	2
35	1
36	4
38	2
39	2
41	4
47	3
48	4
49	4
57	2
59	2
63	2
64	2

ANB 3066 PROPLNT (ANB P POLYMER) TENSILE SM, 1750 IN/MIN, 600 PSI, 77 DEG, LND

This sample size summary is applicable to figures 5-13, 5-14 and 5-15



$F = +4.7434850E+00$   
 $R = +2.6861014E-01$   
 $l = +2.1779543E+00$   
 $N = 63$   
 $Y = ( (+5.6675424E+02) + ( +6.3953593E-01 ) * X )$   
 SIGNIFICANCE OF F = 4. SIGNIFICANT  
 SIGNIFICANCE OF R = SIGNIFICANT  
 SIGNIFICANCE OF l = SIGNIFICANT  
 DEGREES OF FREEDOM = 61  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 77 DEG F, AMB RH  
 $G_w = +3.6493174E+01$   
 $S_e = +2.9364065E-01$   
 $S_t = +3.5438973E+01$



ANB 3066 PROPLANT (ANB P POLYMER) TENSILE SM, 1750 IN/MIN, 600 PSI, 77 DEG, LND

Figure 5-13

$$Y = ((+3.0177921E-01) + (-3.2680354E-04) \times X)$$

Parameter	Value	Significance	Test Conditions
F	+4.4341162E+00	SIGNIFICANCE OF F = .01	77 DEG F, AMB RH
R	-2.6031633E-01	SIGNIFICANCE OF R = .01	
t	+2.1057341E+00	SIGNIFICANCE OF t = .01	
N	63	DEGREES OF FREEDOM = 61	
STORAGE CONDITIONS = AMB TEMP/RH			

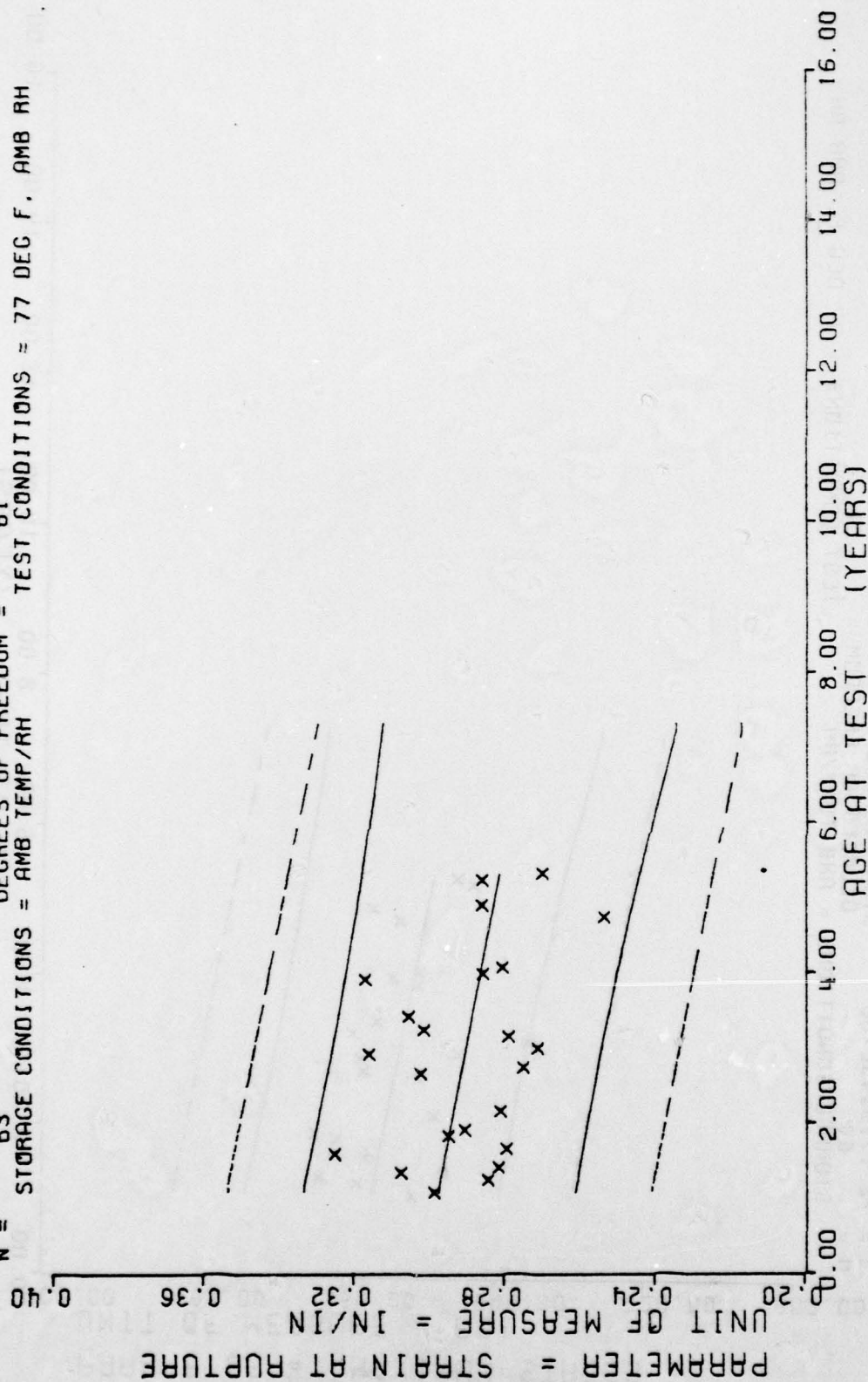
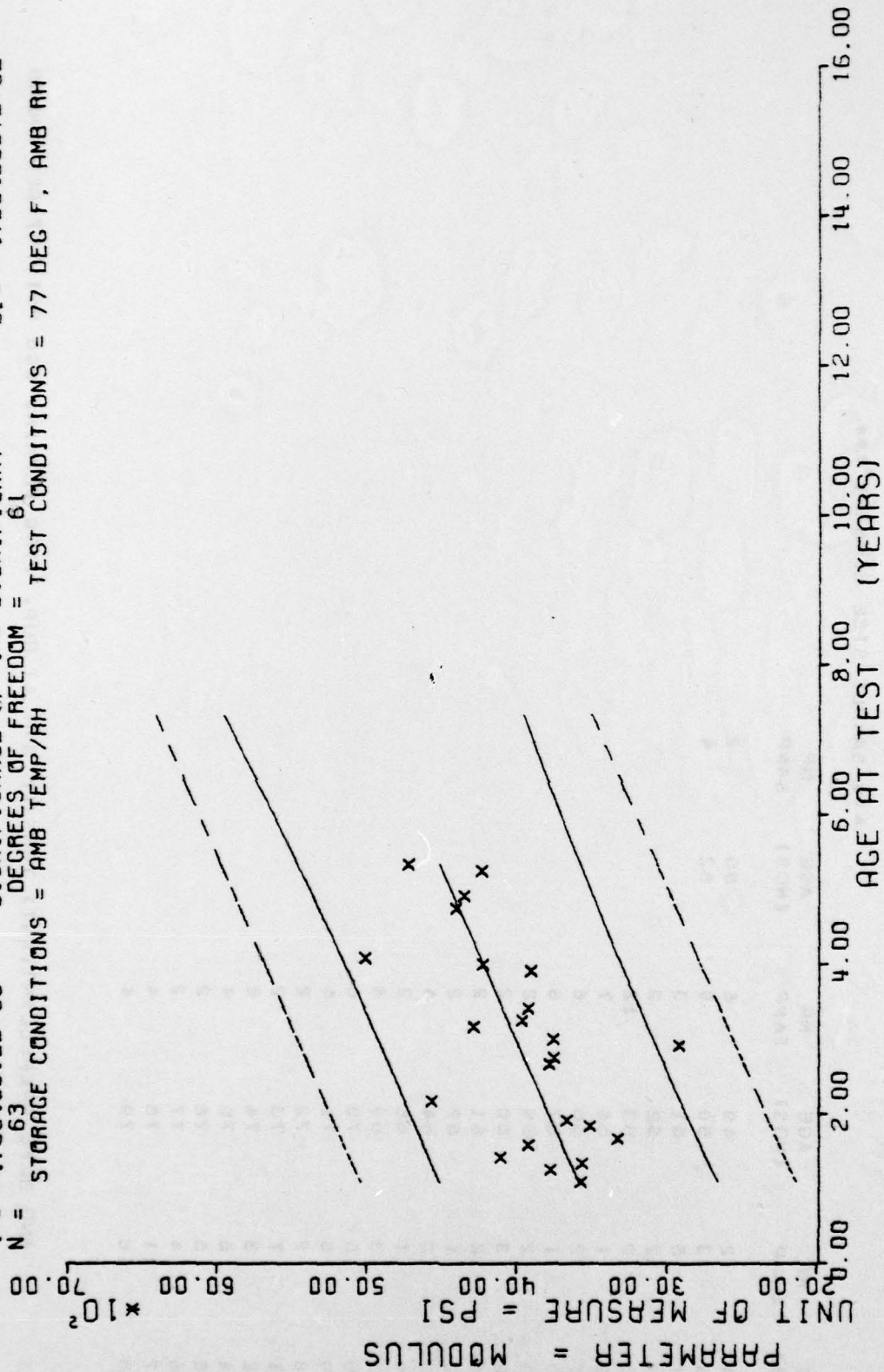


Figure 5-14

$Y = ((+3.3637796E+03) + (+1.8120166E+01) * X)$   
 $F = +2.0291072E+01$  SIGNIFICANCE OF F = SIGNIFICANT  
 $R = +4.9960994E-01$  SIGNIFICANCE OF R = SIGNIFICANT  
 $t = +4.5045612E+00$  SIGNIFICANCE OF t = SIGNIFICANT  
 $N = 63$  DEGREES OF FREEDOM = 61  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 77 DEG F, AMB RH



ANB 3066 PROPLNT (ANB P POLYMER) TENSILE MOD 1750 IN/MIN 77 DEG 600 PSI LINED

Figure 5-15



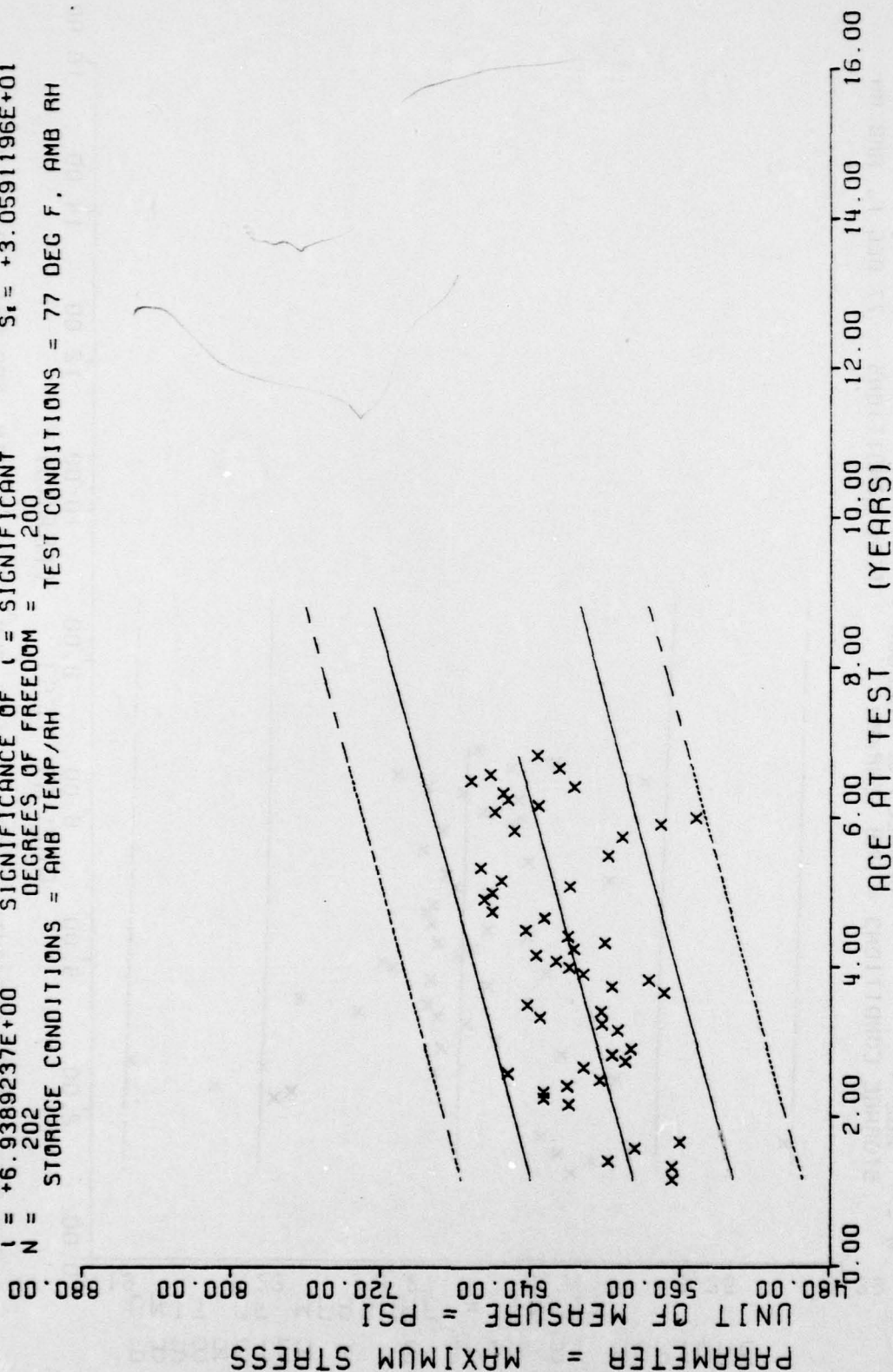
\*\*\* SAMPLE SIZE SUMMARY \*\*\*

AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP
14	2	49	6	80	2
16	3	50	9	82	4
17	5	51	3		
19	2	52	2		
20	2	53	12		
26	1	54	7		
27	2	56	6		
28	1	57	6		
29	2	59	2		
30	3	60	2		
31	2	61	2		
32	1	62	2		
33	2	64	4		
34	1	66	2		
35	3	69	4		
38	5	70	6		
39	5	71	4		
40	2	72	2		
41	7	73	2		
42	3	74	6		
44	6	75	4		
45	6	76	2		
46	4	77	2		
47	11	78	4		
48	10	79	4		

ANB 3066 PRCPPELLANT(ANT) TENSILE STN AT RUP. 1750 IN/MIN. 600 PSI. 77 DEG UNLND

This sample size summary is applicable to figures 5-16, 5-17 and 5-18

$Y = ((+5.7332999E+02) + (+8.9576249E-01) * X)$   
 $F = +4.8148662E+01$  SIGNIFICANCE OF F = SIGNIFICANT  
 $R = +4.4049009E-01$  SIGNIFICANCE OF R = SIGNIFICANT  
 $t = +6.9389237E+00$  SIGNIFICANCE OF t = SIGNIFICANT  
 $N = 202$  DEGREES OF FREEDOM = 200  
 STORAGE CONDITIONS = AMB TEMP/AH TEST CONDITIONS = 77 DEG F, AMB RH



$Y = ((+2.8650323E-01) + (+4.4719567E-05) * X)$   
 $F = +1.2690886E-01$  SIGNIFICANCE OF F = NOT SIGNIFICANT  $\sigma_r = +2.9682606E-02$   
 $R = +2.5182175E-02$  SIGNIFICANCE OF R = NOT SIGNIFICANT  $S_e = +1.2553117E-04$   
 $t = +3.5624270E-01$  SIGNIFICANCE OF t = NOT SIGNIFICANT  $S_t = +2.9747283E-02$   
 $N = 202$  DEGREES OF FREEDOM = 200  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 77 DEG F, AMB RH

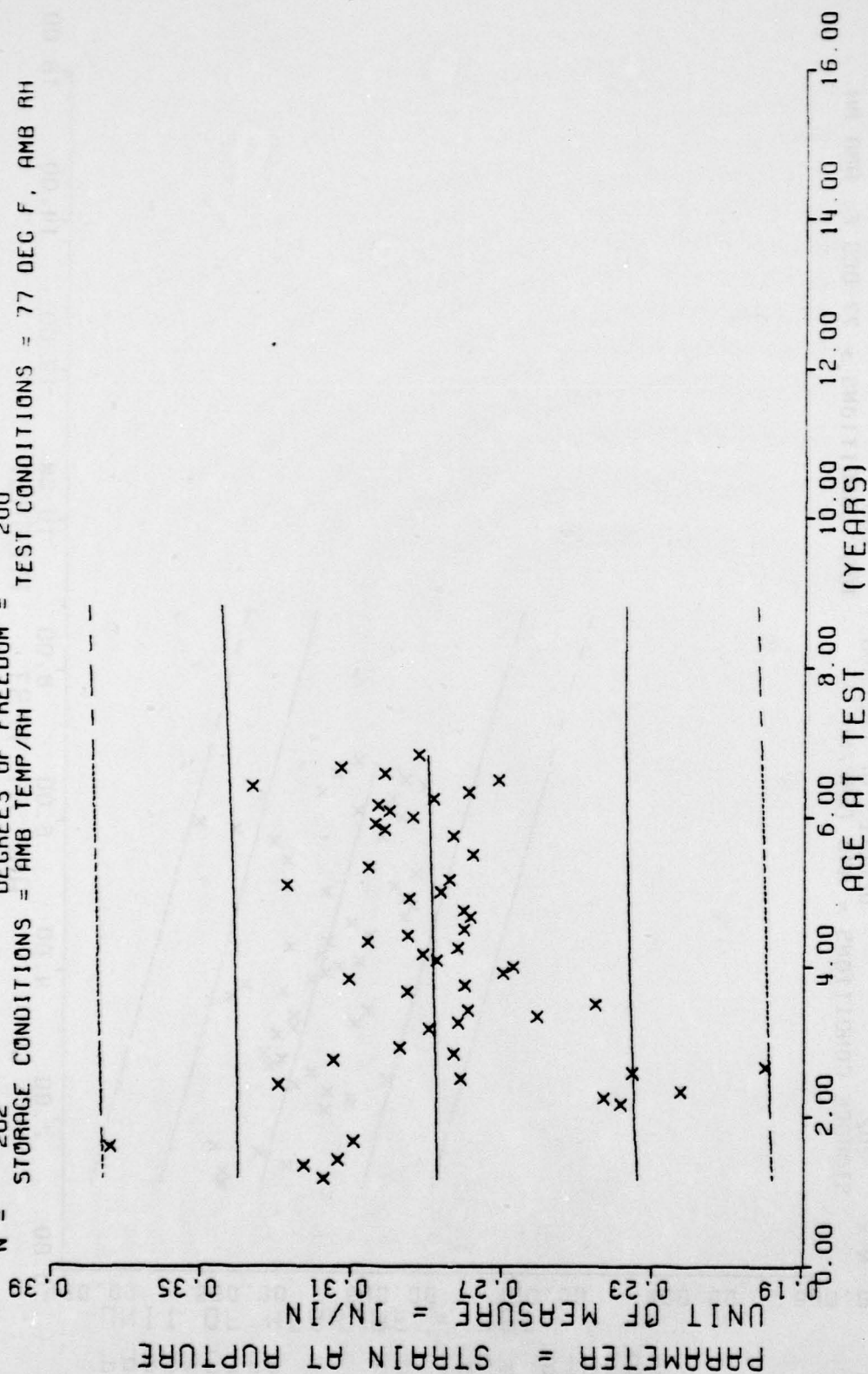
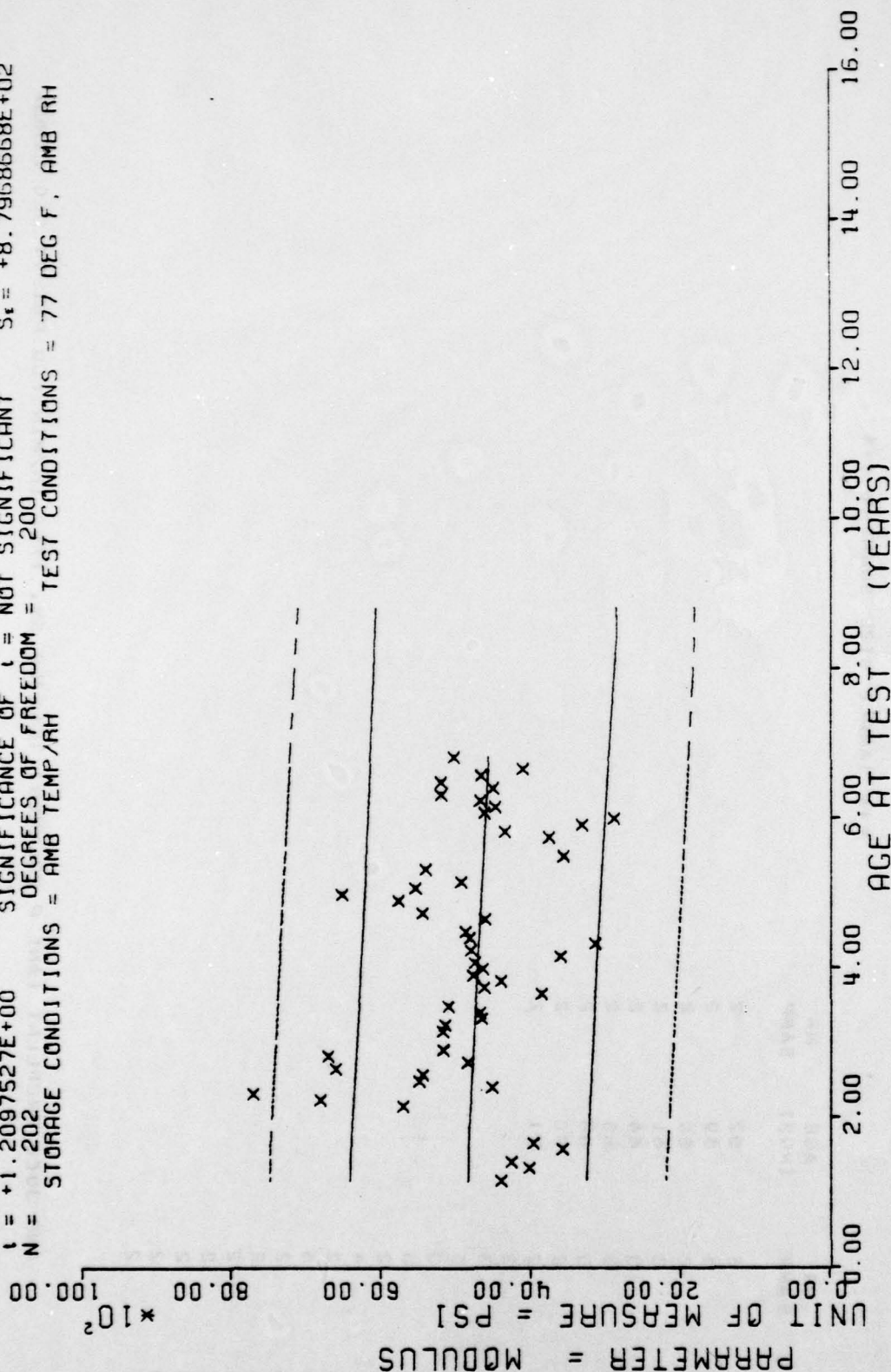


Figure 5-17



$Y = ((+4.9083365E+03) + (-4.4908538E+00) \times X)$   
 $F = +1.4635017E+00$  SIGNIFICANCE OF F = NOT SIGNIFICANT  $G = +8.8070036E+02$   
 $R = -8.5231165E-02$  SIGNIFICANCE OF R = NOT SIGNIFICANT  $S_a = +3.7122080E+00$   
 $t = +1.2097527E+00$  SIGNIFICANCE OF t = NOT SIGNIFICANT  $S_t = +8.7968668E+02$   
 $N = 202$  DEGREES OF FREEDOM = 200  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 77 DEG F, AMB RH



ANB 3066 PROPELLANT (ANT) TENSILE MODULUS, 1750 IN/MIN, 600 PSI, 77 DEG UNLND

Figure 5-18

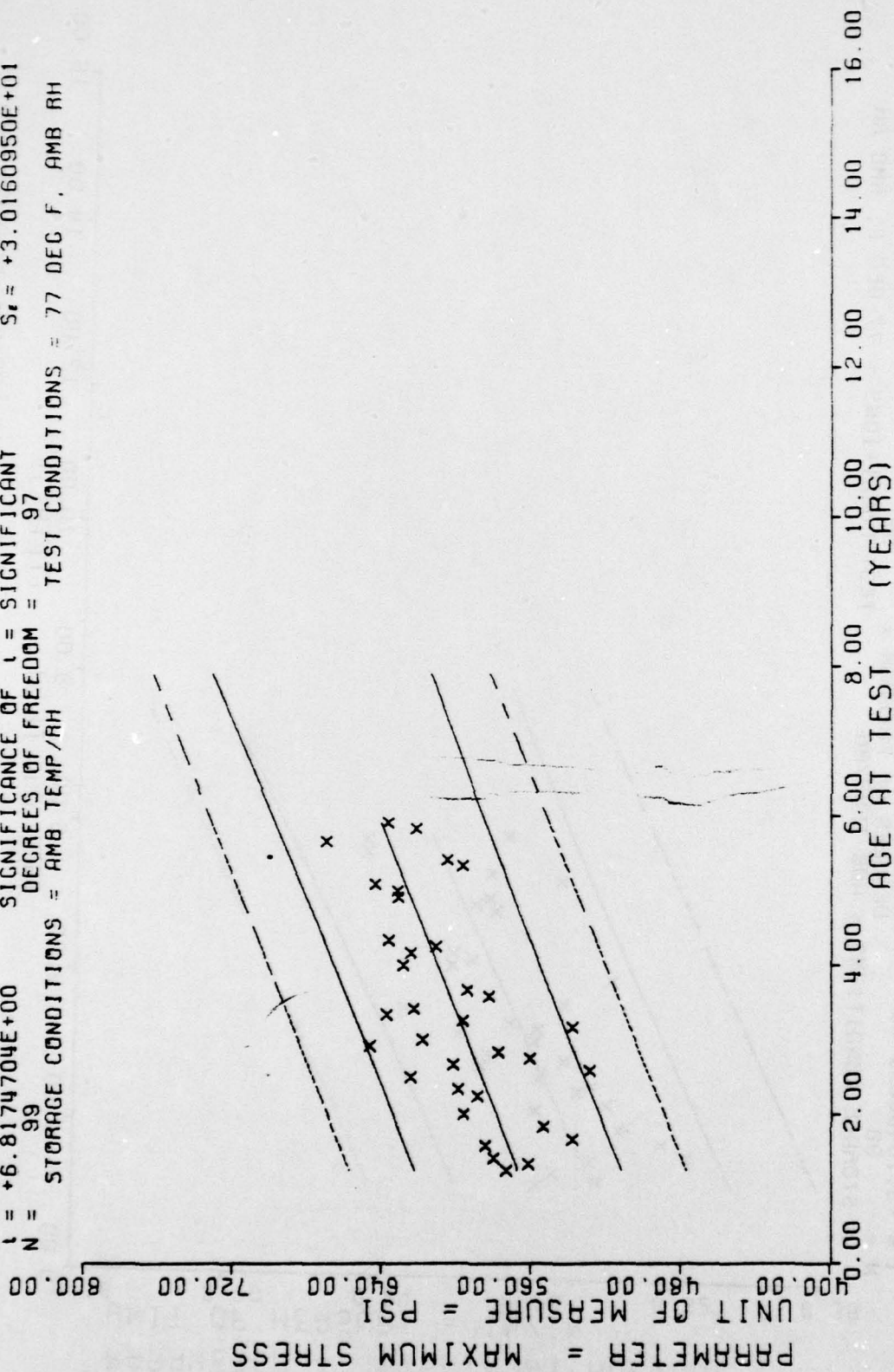
\*\*\* SAMPLE SIZE SUMMARY \*\*\*

AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP
15	5	52	2
16	5	59	2
17	2	60	2
19	5	61	2
20	3	64	2
22	3	65	2
24	3	68	2
27	8	70	2
28	2	71	2
30	2		
31	3		
32	5		
33	3		
34	5		
35	2		
36	4		
38	2		
39	5		
40	2		
41	2		
43	2		
44	2		
48	2		
50	2		
51	2		

ANB 3066 PRCFLLNT (ANT P POLYMER) TENSILE SM. 1750 IN/MIN 600 PSI 77 DEG LINED

This sample size summary is applicable to figures 5-19, 5-20 and 5-21

$Y = ((+5.4750447E+02) + (+1.3076682E+00) * X)$   
 $F = +4.6477903E+01$  SIGNIFICANCE OF F = SIGNIFICANT  $G_1 = +3.6494255E+01$   
 $R = +5.6915525E-01$  SIGNIFICANCE OF R = SIGNIFICANT  $S_1 = +1.9181135E-01$   
 $t = +6.8174704E+00$  SIGNIFICANCE OF t = SIGNIFICANT  $S_2 = +3.0160950E+01$   
 $N = 99$  DEGREES OF FREEDOM = 97  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 77 DEG F, AMB RH

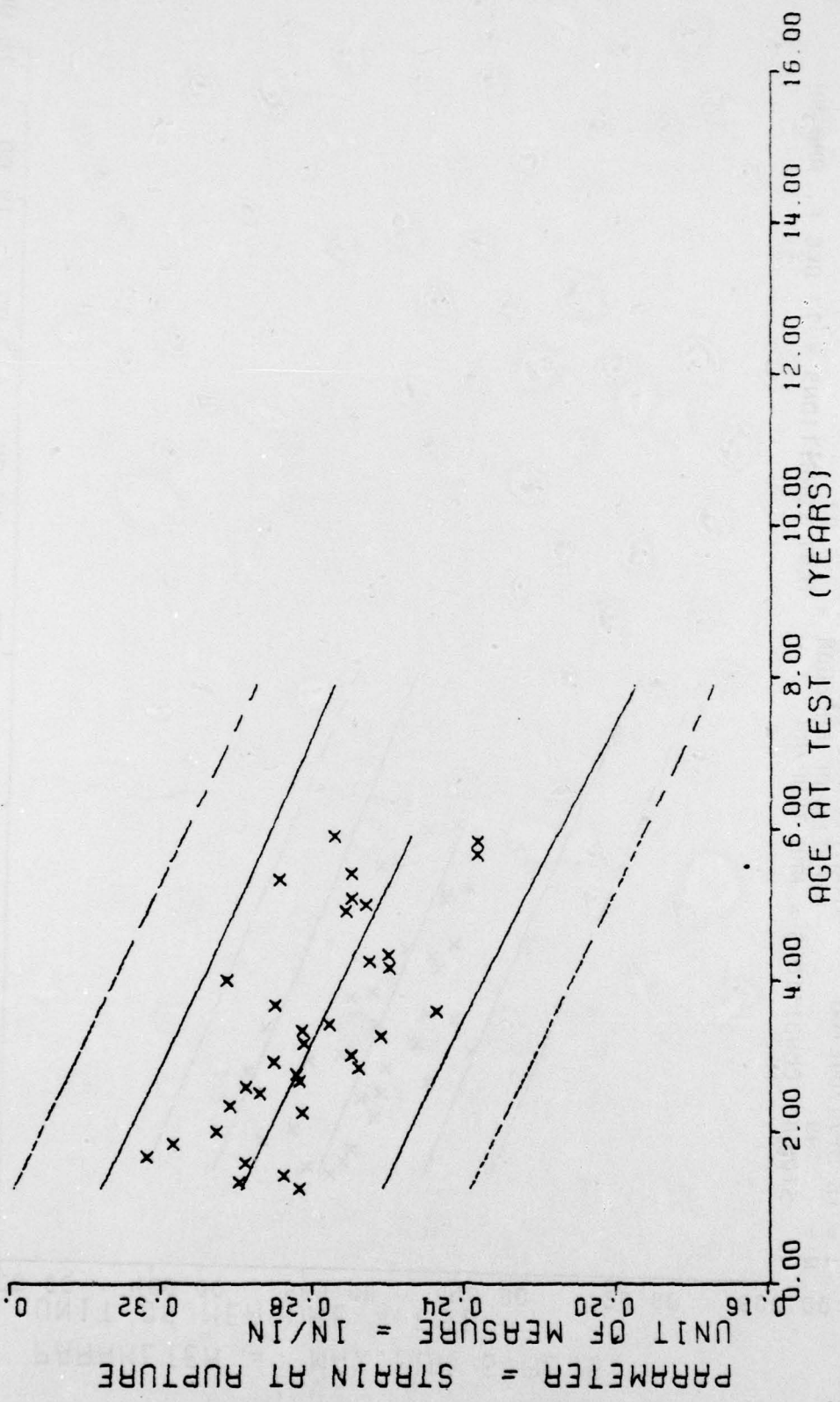


ANB 3066 PROPELLANT (ANT P POLYMER) TENSILE SM, 1750 IN/MIN 600 PSI 77 DEG LINED

Figure 5-19



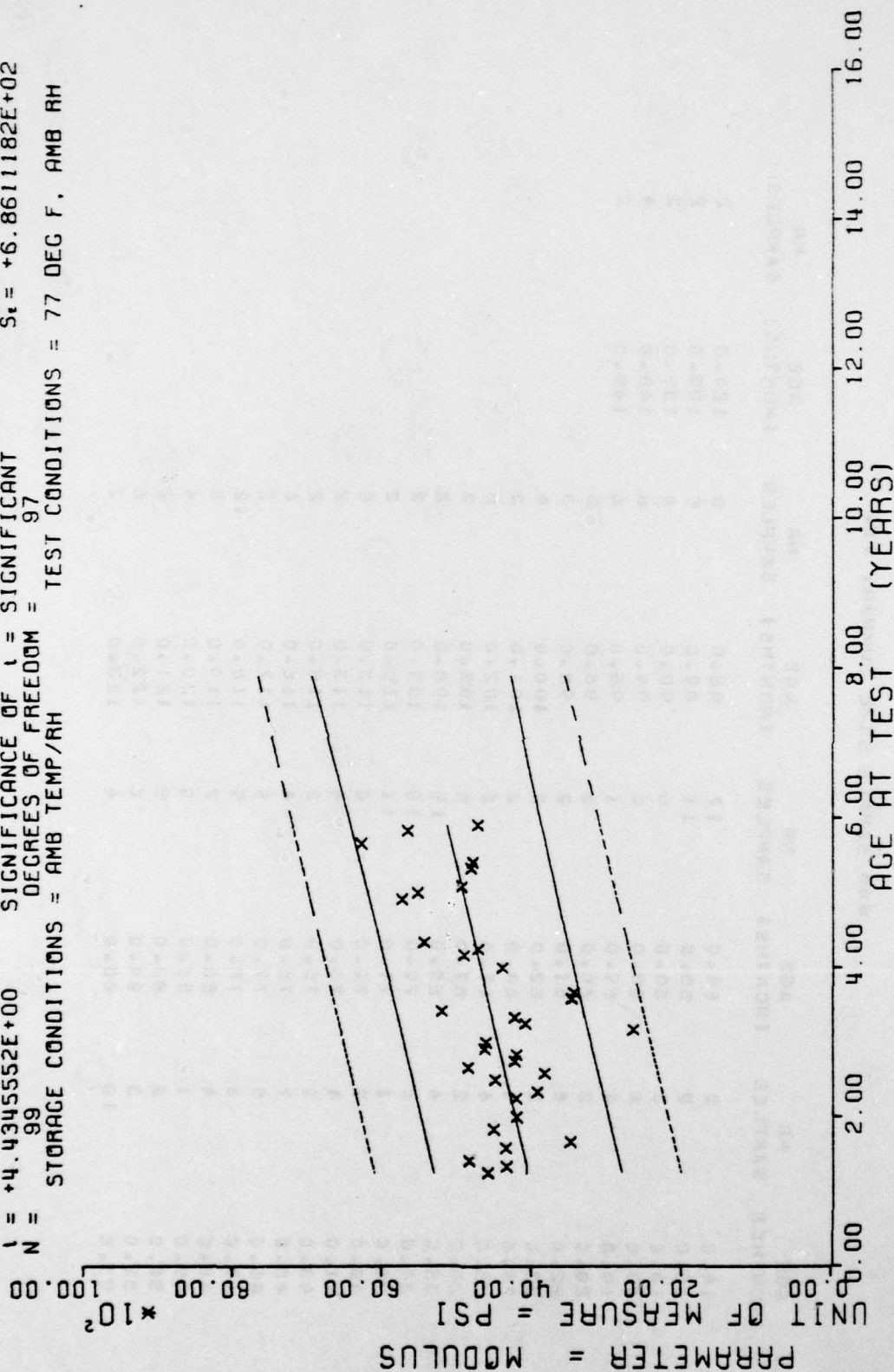
$Y = ((+3.1101492E-01) + (-8.0506891E-04) \times X)$   
 $F = +3.7995660E+01$  SIGNIFICANCE OF F = SIGNIFICANT  
 $R = -5.3250247E-01$  SIGNIFICANCE OF R = SIGNIFICANT  
 $t = +6.1640620E+00$  SIGNIFICANCE OF t = SIGNIFICANT  
 $N = 98$  DEGREES OF FREEDOM = 96  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 77 DEG F, AMB RH



ANB 3066 PROPELLANT (ANT P POLYMER) TENSILE ER, 1750 IN/MIN 600 PSI 77 DEG LINED

Figure 5-20

$Y = ((+3.7730285E+03) + ((+1.9349700E+01) * X))$   
 $F = +1.9665280E+01$  SIGNIFICANCE OF F = SIGNIFICANT  
 $R = +4.1056247E-01$  SIGNIFICANCE OF R = SIGNIFICANT  
 $l = +4.4345552E+00$  SIGNIFICANCE OF l = SIGNIFICANT  
 $N = 99$  DEGREES OF FREEDOM = 97  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 77 DEG F, AMB RH



AMB 3066 PROPLANT (ANT P POLYMER) TENSILE MOD, 1750 IN/MIN 600 PSI 77 DEG, LINED

Figure 5-21

\*\*\* SAMPLE SIZE SUMMARY \*\*\*

AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES
14.0	2	84.0	17	88.0	8	124.0	2
15.0	2	85.0	11	89.0	5	129.0	2
16.0	2	86.0	6	90.0	8	137.0	2
18.0	2	88.0	6	94.0	6	148.0	4
19.0	2	89.0	1	95.0	6	149.0	2
20.0	2	90.0	5	96.0	6		
22.0	6	91.0	2	98.0	3		
23.0	2	92.0	2	100.0	4		
24.0	4	94.0	2	101.0	2		
25.0	4	95.0	2	102.0	8		
26.0	2	97.0	4	105.0	2		
33.0	4	99.0	10	108.0	2		
34.0	6	100.0	10	109.0	2		
38.0	1	101.0	11	110.0	2		
40.0	2	102.0	8	112.0	2		
41.0	4	103.0	4	113.0	2		
43.0	2	105.0	2	115.0	2		
45.0	7	106.0	4	116.0	6		
46.0	5	107.0	5	117.0	2		
47.0	2	108.0	5	118.0	12		
48.0	4	109.0	2	119.0	5		
49.0	1	110.0	9	120.0	4		
50.0	2	111.0	5	121.0	2		
52.0	3	112.0	6	122.0	6		
53.0	10	113.0	4	123.0	2		

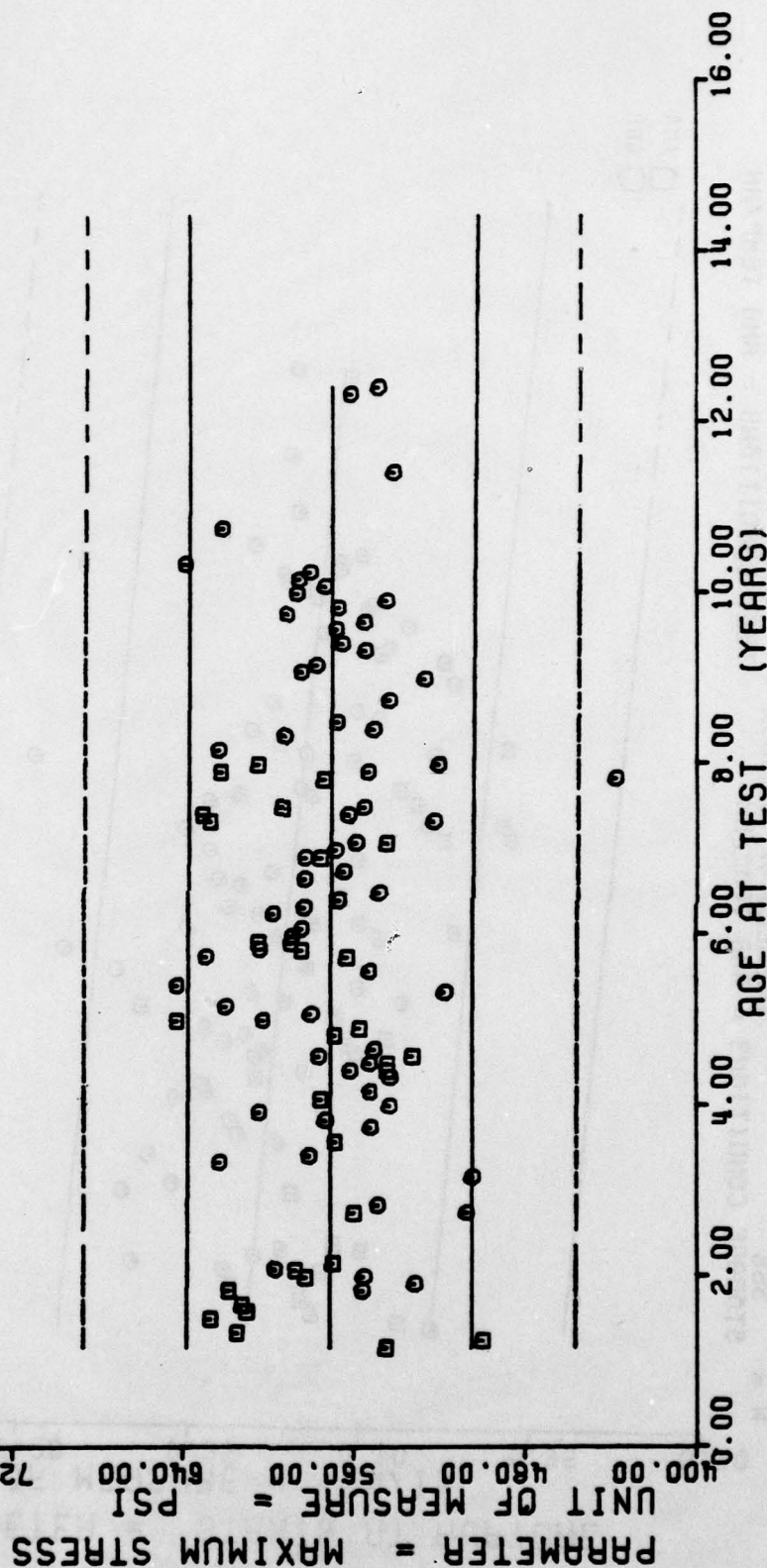
ANB 3066 PRCPLTNT (ANA & ANB. G POLYMER) TENSILE SM 1750 IN/MIN 600 PSI

This sample size summary is applicable to figures 5-22, 5-23 and 5-24



$Y = ((+5.7219629E+02) + (-2.2133697E-02) * X)$   
 $F = +1.0803494E-01$  SIGNIFICANCE OF F = NOT SIGNIFICANT  $S_f = +3.8427455E+01$   
 $R = -1.7491551E-02$  SIGNIFICANCE OF R = NOT SIGNIFICANT  $S_r = +6.7339803E-02$   
 $I = +3.2868669E-01$  SIGNIFICANCE OF I = NOT SIGNIFICANT  $S_i = +3.8475959E+01$   
 $N = 355$  DEGREES OF FREEDOM = 353  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH

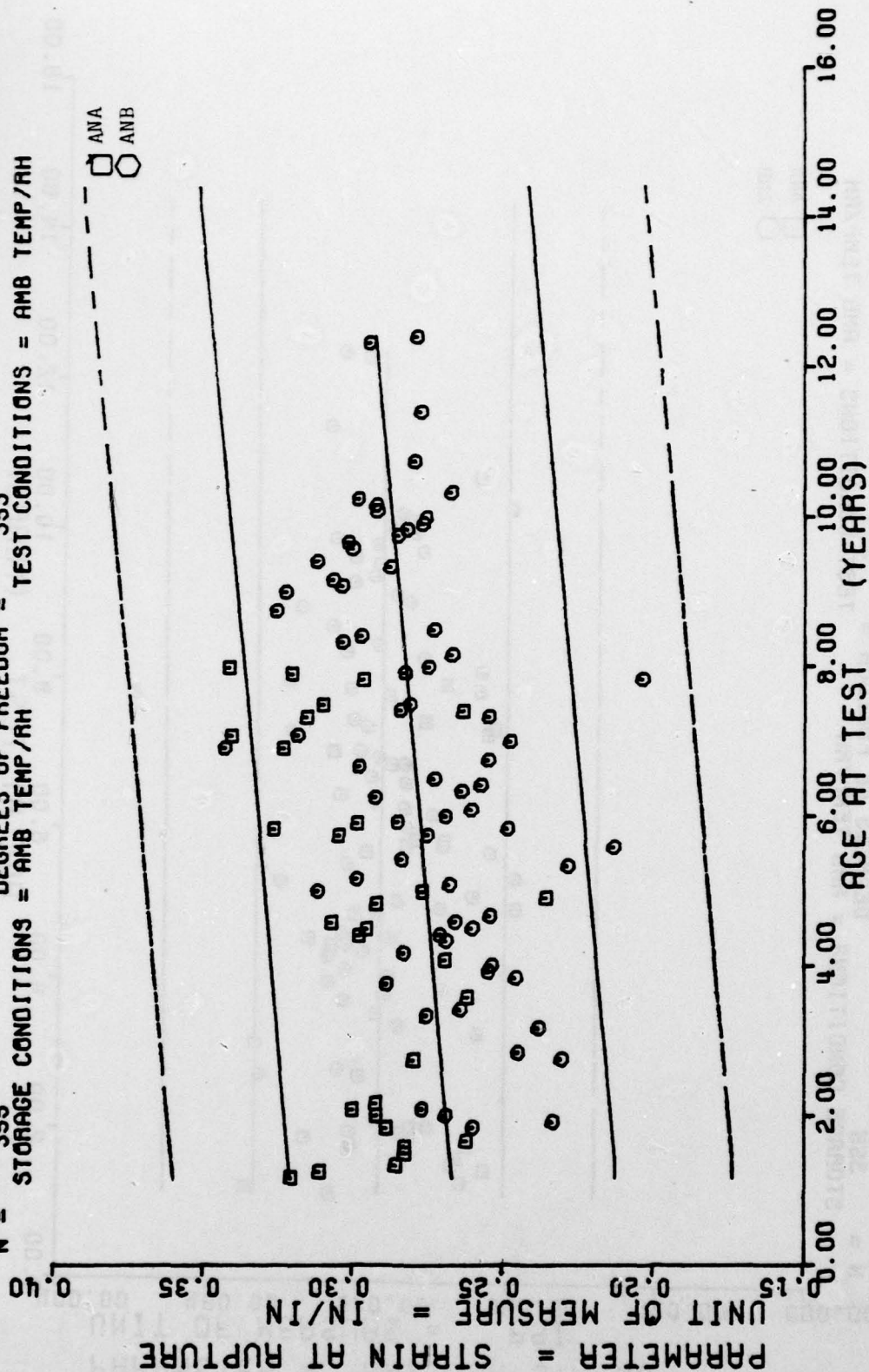
□ ANA  
 ○ ANB



AMB 3066 PROPLINT (ANA & ANB, G POLYMER) TENSILE SM 1750 IN/MIN 600 PSI

Figure 5-22

$Y = ((+2.6389843E-01) + ((+1.8676679E-04) * X)$   
 $F = +1.1824761E+01$  SIGNIFICANCE OF F = SIGNIFICANT  $G_r = +3.1503702E-02$   
 $R = +1.8003379E-01$  SIGNIFICANCE OF R = SIGNIFICANT  $S_r = +5.4312959E-05$   
 $L = +3.4387150E+00$  SIGNIFICANCE OF L = SIGNIFICANT  $S_r = +3.1032808E-02$   
 $N = 355$  DEGREES OF FREEDOM = 353  
 STORAGE CONDITIONS = AMB TEMP/AH TEST CONDITIONS = AMB TEMP/AH

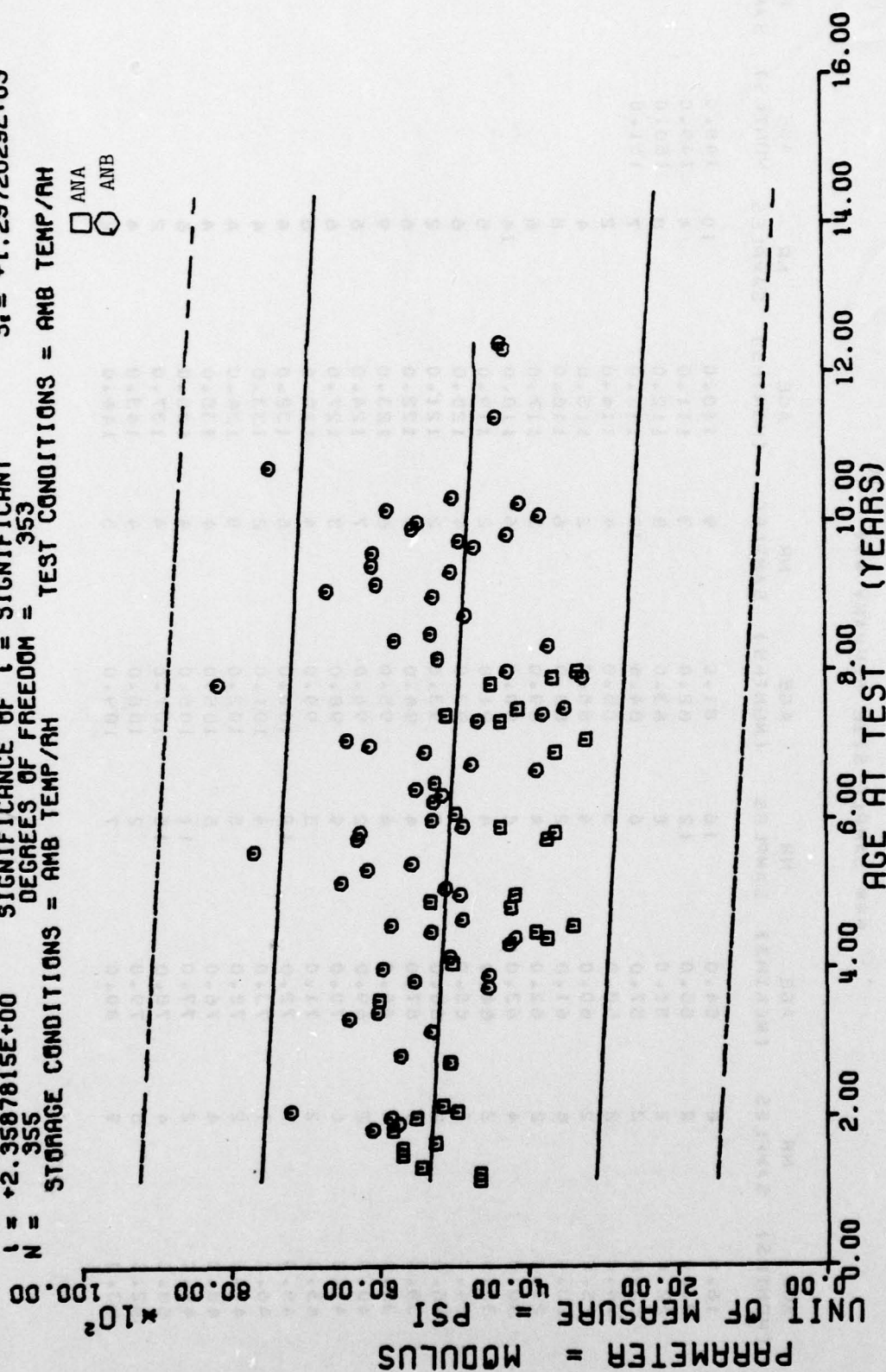


ANB 3066 PADPLNT (ANA & ANB UNLND. G POLYMER) TENSILE EA 1750 IN/MIN, 600 PSI

Figure 5-23

$Y = ((+5.4306469E+03) + (-5.3552290E+00) * X)$   
 $F = +5.5638503E+00$  SIGNIFICANCE OF F = SIGNIFICANT  
 $R = -1.2456741E-01$  SIGNIFICANCE OF R = SIGNIFICANT  
 $t = +2.3587815E+00$  SIGNIFICANCE OF t = SIGNIFICANT  
 $N = 355$  DEGREES OF FREEDOM = 353  
 STORAGE CONDITIONS = AMB TEMP/AH TEST CONDITIONS = AMB TEMP/AH

□ ANA  
 ○ ANB



ANB 3066 PROPLINT (ANA & ANB UNLND, G POLYMER) TENSILE MOD 1750 IN/MIN, 600 PSI

Figure 5-24

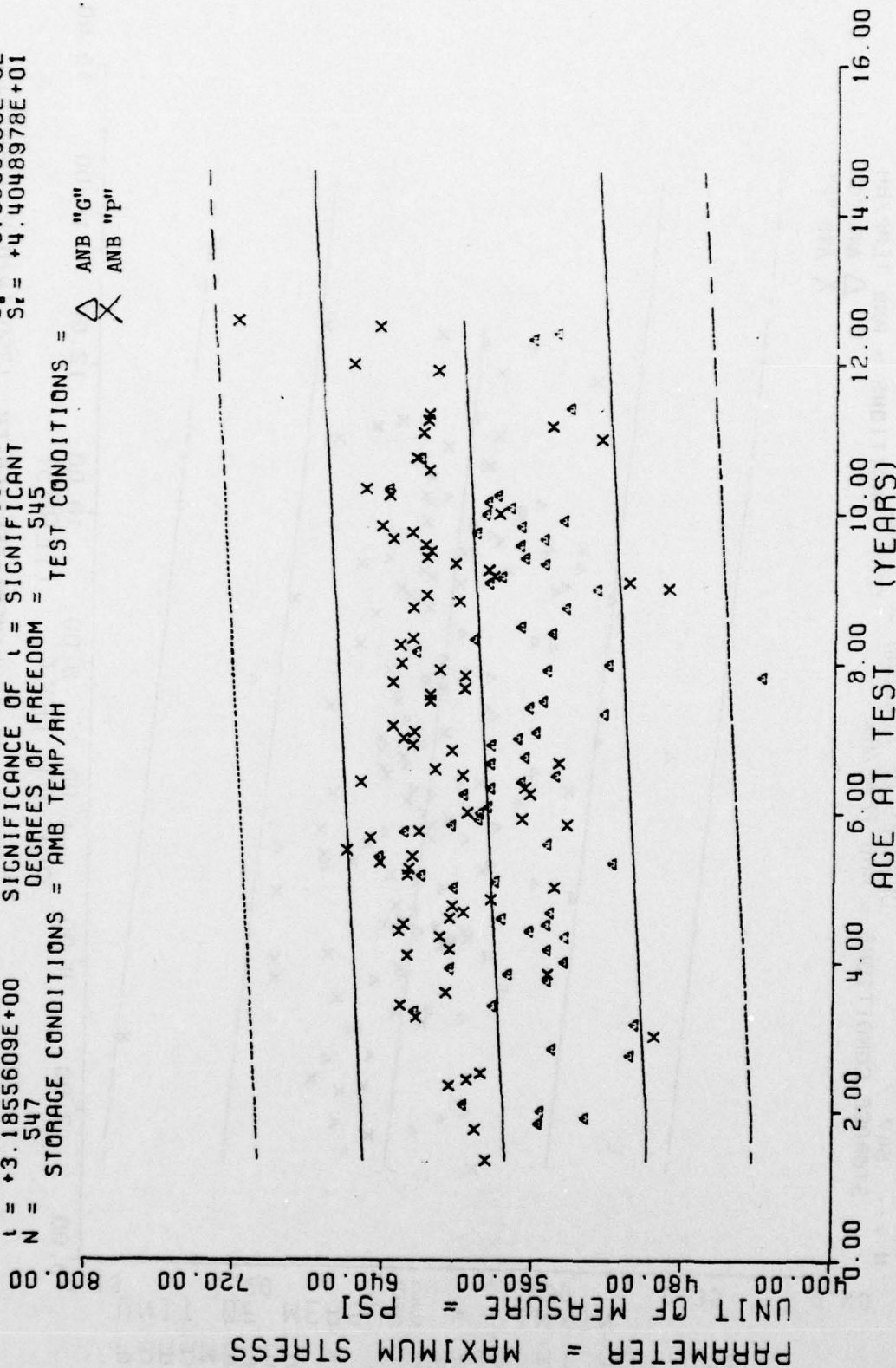


AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES
16.0	8	54.0	16	81.0	9	110.0	10
21.0	2	55.0	12	82.0	3	111.0	4
22.0	2	56.0	6	83.0	8	112.0	8
23.0	2	57.0	6	84.0	12	113.0	7
24.0	2	58.0	3	85.0	4	114.0	2
25.0	2	60.0	4	86.0	2	115.0	4
28.0	6	61.0	2	88.0	6	116.0	8
29.0	2	62.0	4	89.0	3	117.0	6
30.0	4	63.0	6	90.0	6	118.0	14
33.0	2	64.0	4	91.0	2	119.0	5
34.0	6	65.0	4	92.0	4	120.0	6
36.0	2	66.0	2	93.0	2	121.0	2
38.0	1	67.0	4	94.0	6	122.0	6
39.0	4	68.0	4	95.0	8	123.0	9
40.0	2	69.0	12	96.0	7	124.0	6
41.0	6	70.0	9	98.0	3	127.0	6
43.0	2	71.0	5	99.0	4	129.0	6
45.0	7	72.0	15	100.0	6	132.0	4
46.0	7	73.0	4	101.0	2	133.0	4
47.0	2	75.0	5	102.0	8	134.0	4
48.0	2	76.0	5	105.0	4	135.0	4
49.0	2	77.0	11	106.0	4	136.0	6
50.0	4	78.0	15	107.0	4	137.0	2
52.0	5	79.0	2	108.0	4	143.0	4
53.0	5	80.0	7	109.0	5	144.0	2

ANB 3J66 PROPLNT (ANB UNLINED, G & F POLYMER) TENSILE SM, 1750 IN/MIN, 600 PSI

This sample size summary is applicable to figures 5-25 and 5-26

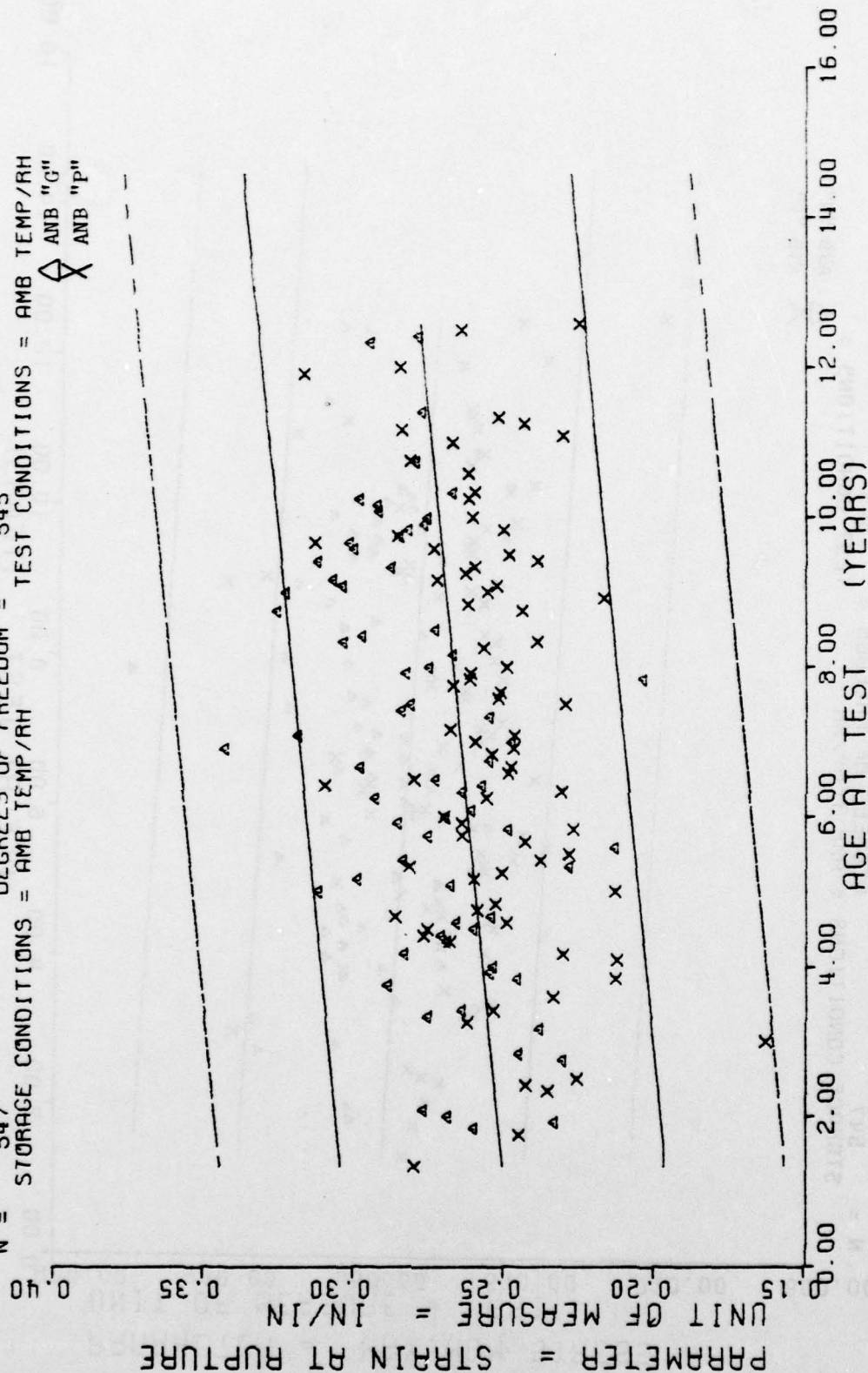
$F = +1.0147798E+01$   
 $R = +1.3520152E-01$   
 $t = +3.1855609E+00$   
 $N = 547$   
 $Y = ((+5.7098374E+02) + (+1.8732235E-01) \times X)$   
 SIGNIFICANCE OF F = SIGNIFICANT  
 SIGNIFICANCE OF R = SIGNIFICANT  
 SIGNIFICANCE OF t = SIGNIFICANT  
 DEGREES OF FREEDOM = 545  
 STORAGE CONDITIONS = AMB TEMP/RH  
 TEST CONDITIONS =  
 $\sigma_r = +4.4416448E+01$   
 $S_s = +5.8803569E-02$   
 $S_t = +4.4048978E+01$   
 $\Delta$  ANB "G"  
 $\times$  ANB "P"



ANB 3066 PROPLNT (ANB UNLINED, G & P POLYMER) TENSILE SM, 1750 IN/MIN, 600 PSI

Figure 5-25

$Y = ((+2.4734469E-01) + (+2.0062649E-04) \times X)$   
 $F = +2.3083587E+01$  SIGNIFICANCE OF F = SIGNIFICANT  
 $R = +2.0157911E-01$  SIGNIFICANCE OF R = SIGNIFICANT  
 $t = +4.8045382E+00$  SIGNIFICANCE OF t = SIGNIFICANT  
 $N = 547$  DEGREES OF FREEDOM = 545  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH  
 ANB "G"  
 ANB "P"



ANB 3066 PROPLANT (ANB UNLINED, G & P POLYMER) TENSILE ER, 1750 IN/MIN, 600 PSI

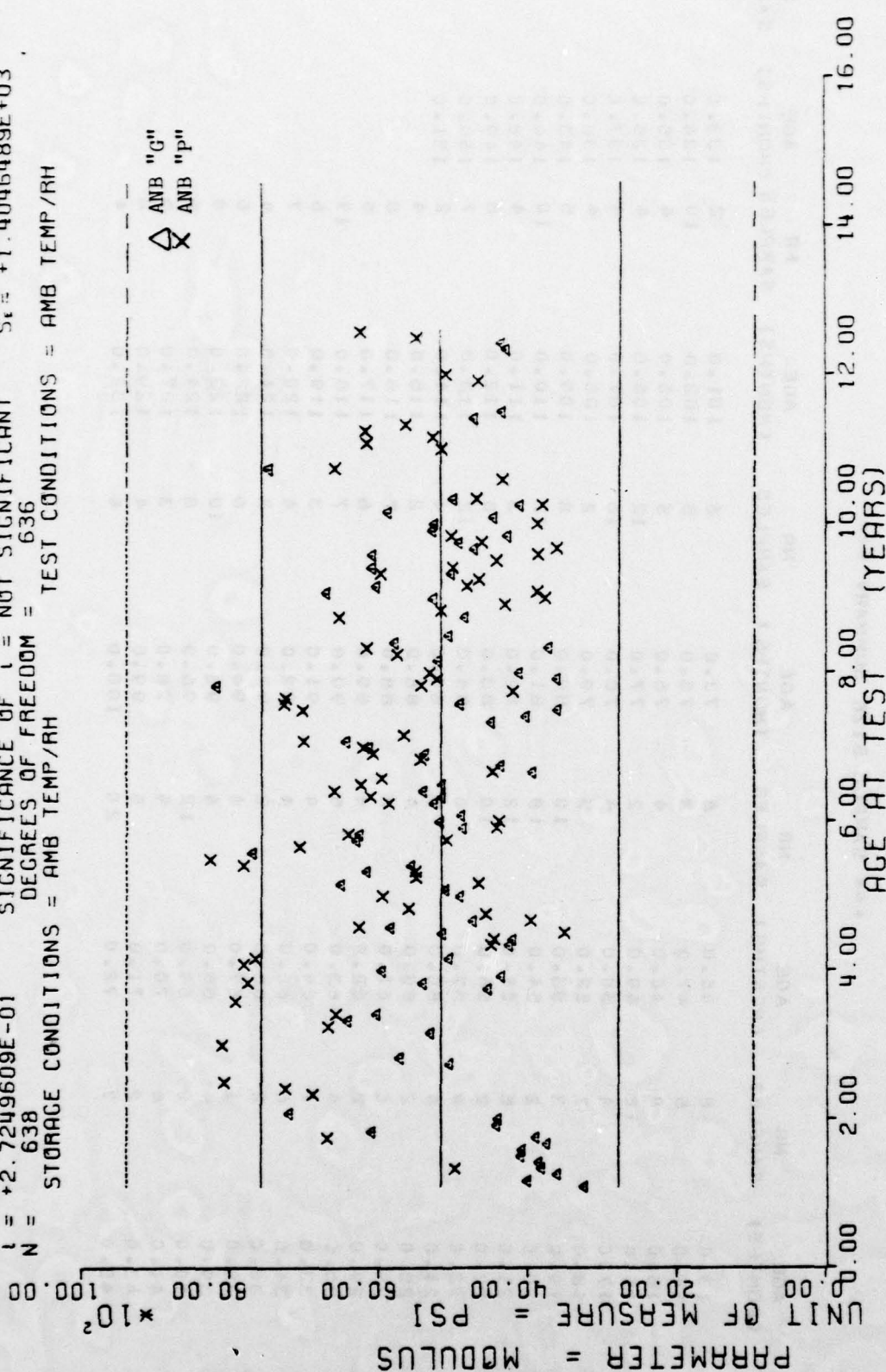
Figure 5-26



AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES
13.0	6	46.0	8	73.0	6	101.0	2
14.0	5	47.0	3	75.0	5	102.0	10
15.0	8	48.0	4	76.0	5	105.0	4
16.0	16	49.0	2	77.0	12	106.0	4
17.0	4	50.0	4	78.0	16	107.0	4
18.0	7	52.0	5	79.0	2	108.0	4
19.0	3	53.0	10	80.0	8	109.0	5
20.0	2	54.0	18	81.0	12	110.0	10
21.0	5	55.0	12	82.0	3	111.0	4
22.0	2	56.0	10	83.0	8	112.0	8
23.0	4	57.0	6	84.0	12	113.0	7
24.0	4	58.0	5	85.0	4	114.0	2
25.0	2	60.0	4	86.0	2	115.0	4
28.0	6	61.0	2	88.0	7	116.0	8
29.0	2	62.0	4	89.0	6	117.0	6
30.0	4	63.0	6	90.0	7	118.0	19
33.0	2	64.0	4	91.0	3	119.0	6
34.0	6	65.0	4	92.0	4	120.0	7
36.0	2	66.0	2	93.0	2	121.0	4
38.0	1	67.0	4	94.0	6	122.0	6
39.0	4	68.0	4	95.0	10	123.0	9
40.0	2	69.0	12	96.0	8	124.0	6
41.0	6	70.0	5	98.0	3	127.0	6
43.0	2	71.0	5	99.0	4	129.0	6
45.0	7	72.0	20	100.0	6	132.0	4

**This sample size summary is applicable to figure 5-27**

$Y = (+5.1982696E+03) + (-4.2563464E-01) \times X$   
 $F = +7.4254121E-02$  SIGNIFICANCE OF F = NOT SIGNIFICANT  $G = +1.4036279E+03$   
 $R = -1.0804542E-02$  SIGNIFICANCE OF R = NOT SIGNIFICANT  $S_p = +1.5619843E+00$   
 $t = +2.7249609E-01$  SIGNIFICANCE OF t = NOT SIGNIFICANT  $S_t = +1.4046489E+03$   
 $N = 638$  DEGREES OF FREEDOM = 636  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH



ANB 3066 PROPLNT (ANB UNLINED, G & P POLYMER) TENSILE MOD, 1750 IN/MIN 600 PSI

Figure 5-27

\*\*\* SAMPLE SIZE SUMMARY \*\*\*

AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES
13.0	3	54.0	1
15.0	2	56.0	2
16.0	6	57.0	2
17.0	6	59.0	2
19.0	6	63.0	2
20.0	4	64.0	2
22.0	4		
23.0	4		
26.0	2		
29.0	2		
31.0	2		
32.0	4		
33.0	2		
35.0	1		
36.0	4		
38.0	2		
39.0	2		
40.0	2		
41.0	4		
42.0	2		
44.0	4		
45.0	2		
47.0	3		
48.0	4		
49.0	4		

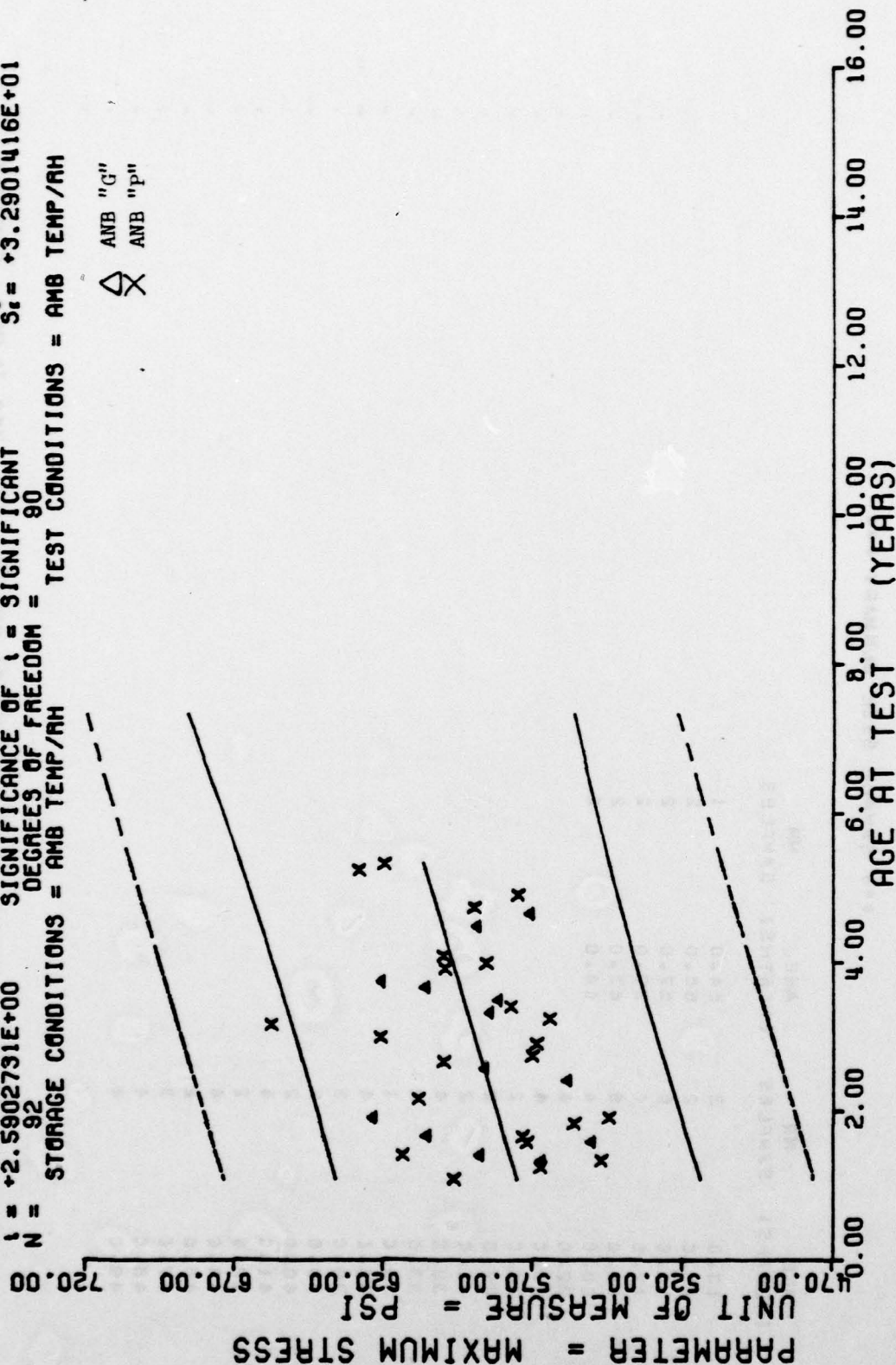
ANB 3066 PRCPLLN1 (ANB LINED. G & F POLYMER) TENSILE SM. 1750 IN/MIN. 600 PSI

This sample size summary is applicable to figures 5-28, 5-29 and 5-30



$F = +6.7095151E+00$  SIGNIFICANCE OF F = SIGNIFICANT  
 $A = +2.6339708E-01$  SIGNIFICANCE OF A = SIGNIFICANT  
 $I = +2.5902731E+00$  SIGNIFICANCE OF I = SIGNIFICANT  
 $N = 92$  DEGREES OF FREEDOM = 90  
 STORAGE CONDITIONS = AMB TEMP/AH TEST CONDITIONS = AMB TEMP/AH

$\Delta$  ANB "G"  
 $\times$  ANB "P"

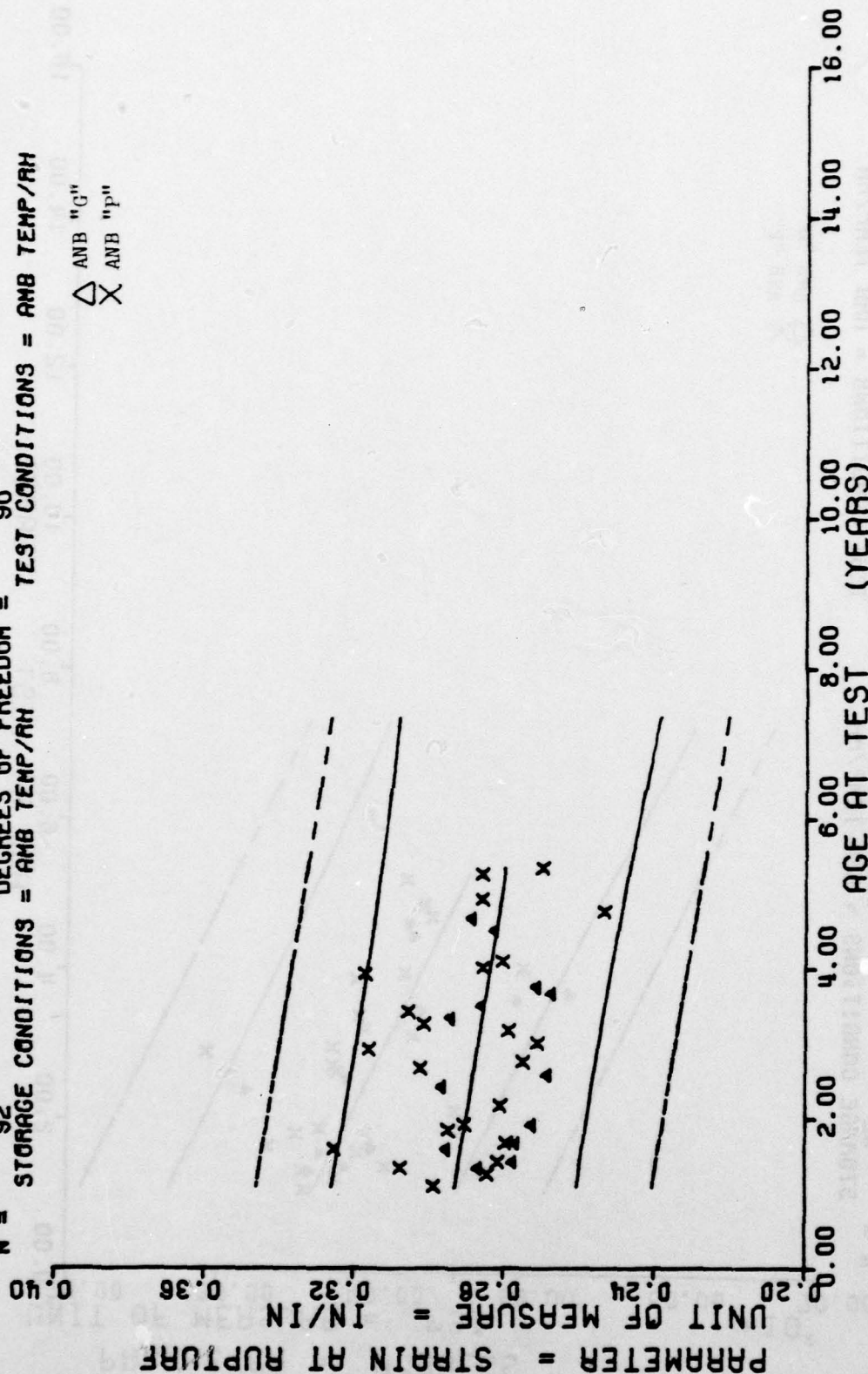


ANB 3066 PROPELLANT (ANB LINED, G & P POLYMER) TENSILE 3M, 1750 IN/MIN, 600 PSI

Figure 5-28

$Y = ((+2.9682608E-01) + (-2.6837866E-04) * X)$   
 $F = +4.5429908E+00$  SIGNIFICANCE OF F = SIGNIFICANT  
 $R = -2.1920792E-01$  SIGNIFICANCE OF R = SIGNIFICANT  
 $t = +2.1314292E+00$  SIGNIFICANCE OF t = SIGNIFICANT  
 $N = 92$  DEGREES OF FREEDOM = 90  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH

$\Delta$  ANB "G"  
 $\times$  ANB "P"

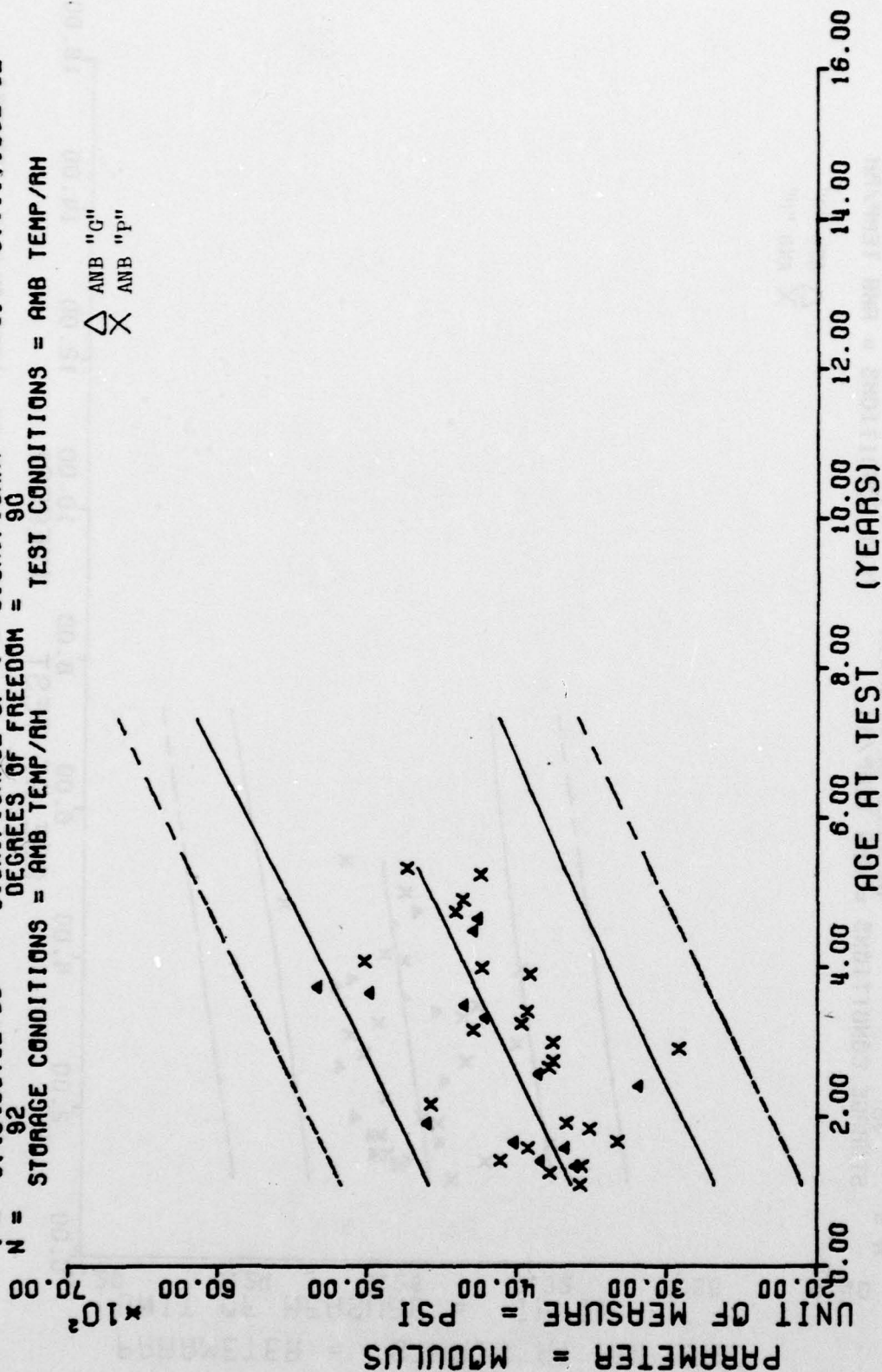


ANB 3066 PROPELLANT (ANB LINED, G & P POLYMER) TENSILE EA, 1750 IN/MIN, 600 PSI

Figure 5-29

$Y = ((+3.3749463E+03) + (+1.9945726E+01) \times X)$   
 $F = +2.9864669E+01$  SIGNIFICANCE OF F = SIGNIFICANT  $S_0 = +5.8666727E+02$   
 $R = +4.9915250E-01$  SIGNIFICANCE OF R = SIGNIFICANT  $S_1 = +3.6498162E+00$   
 $t = +5.4648576E+00$  SIGNIFICANCE OF t = SIGNIFICANT  $S_2 = +5.1117189E+02$   
 $N = 92$  DEGREES OF FREEDOM = 90  
 STORAGE CONDITIONS = AMB TEMP/AH TEST CONDITIONS = AMB TEMP/AH

$\Delta$  ANB "G"  
 $\times$  ANB "P"



ANB 3066 PROPELLANT (ANB LINED). G & P POLYMER) TENSILE MOD. 1750 IN/MIN 600 PSI

Figure 5-30



\*\*\* SAMPLE SIZE SUMMARY \*\*\*

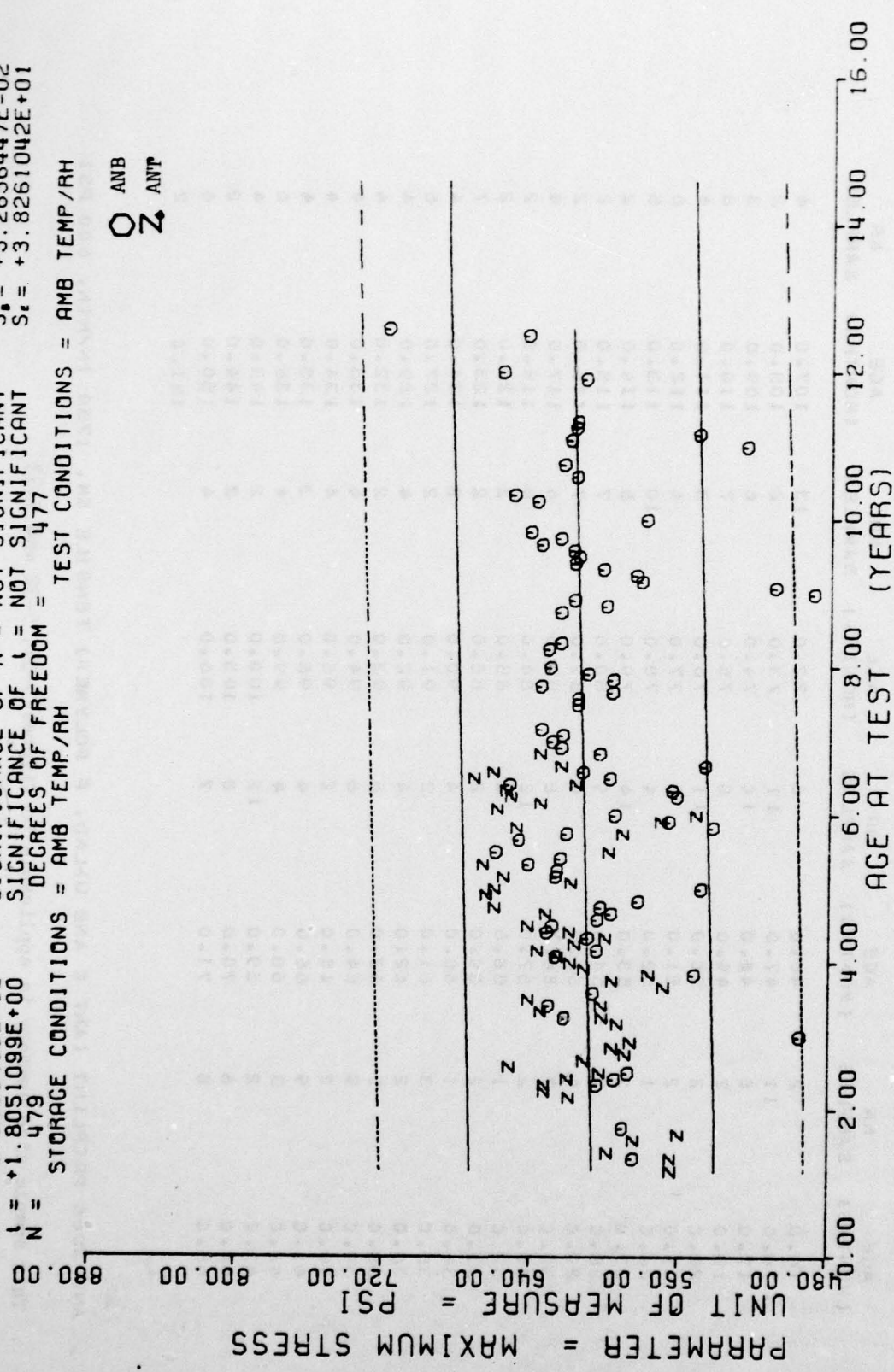
AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES
14.0	2	46.0	6	72.0	13	107.0	4
16.0	11	47.0	11	73.0	2	108.0	2
17.0	5	48.0	10	74.0	6	109.0	3
19.0	2	49.0	8	75.0	7	110.0	8
20.0	2	50.0	11	76.0	3	111.0	4
21.0	2	51.0	3	77.0	4	112.0	6
26.0	1	52.0	4	78.0	10	113.0	5
27.0	2	53.0	14	79.0	6	114.0	2
28.0	7	54.0	5	80.0	7	115.0	2
29.0	4	55.0	4	82.0	7	116.0	2
30.0	7	56.0	8	83.0	6	117.0	4
31.0	2	57.0	12	84.0	6	118.0	2
32.0	1	58.0	5	85.0	2	120.0	2
33.0	2	59.0	2	86.0	2	123.0	7
34.0	1	60.0	4	90.0	2	124.0	4
35.0	3	61.0	2	91.0	2	127.0	6
36.0	2	62.0	4	92.0	4	129.0	4
38.0	5	63.0	6	93.0	2	132.0	4
39.0	9	64.0	6	94.0	4	133.0	4
40.0	2	65.0	2	95.0	4	134.0	4
41.0	9	66.0	4	96.0	3	135.0	4
42.0	3	68.0	4	99.0	4	136.0	6
43.0	2	69.0	12	100.0	2	143.0	4
44.0	6	70.0	8	105.0	2	144.0	2
45.0	6	71.0	7	106.0	4	150.0	4
						151.0	2

ANB 3066 PRCPLNT (ANT & ANB UNLND. P POLYMER) TENSILE SM. 1750 IN/MIN. 600 PSI

This sample size summary is applicable to figures 5-31, 5-32 and 5-33

$Y = ((+6.0498561E+02) + (+9.5050678E-02) * X)$   
 $F = +3.2584219E+00$  SIGNIFICANCE OF F = NOT SIGNIFICANT  $G = +3.8351322E+01$   
 $R = +8.2369450E-02$  SIGNIFICANCE OF R = NOT SIGNIFICANT  $S_0 = +5.2656447E-02$   
 $I = +1.8051099E+00$  SIGNIFICANCE OF I = NOT SIGNIFICANT  $S_1 = +3.8261042E+01$   
 $N = 479$  DEGREES OF FREEDOM = 477  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH

O ANB  
 Z ANT

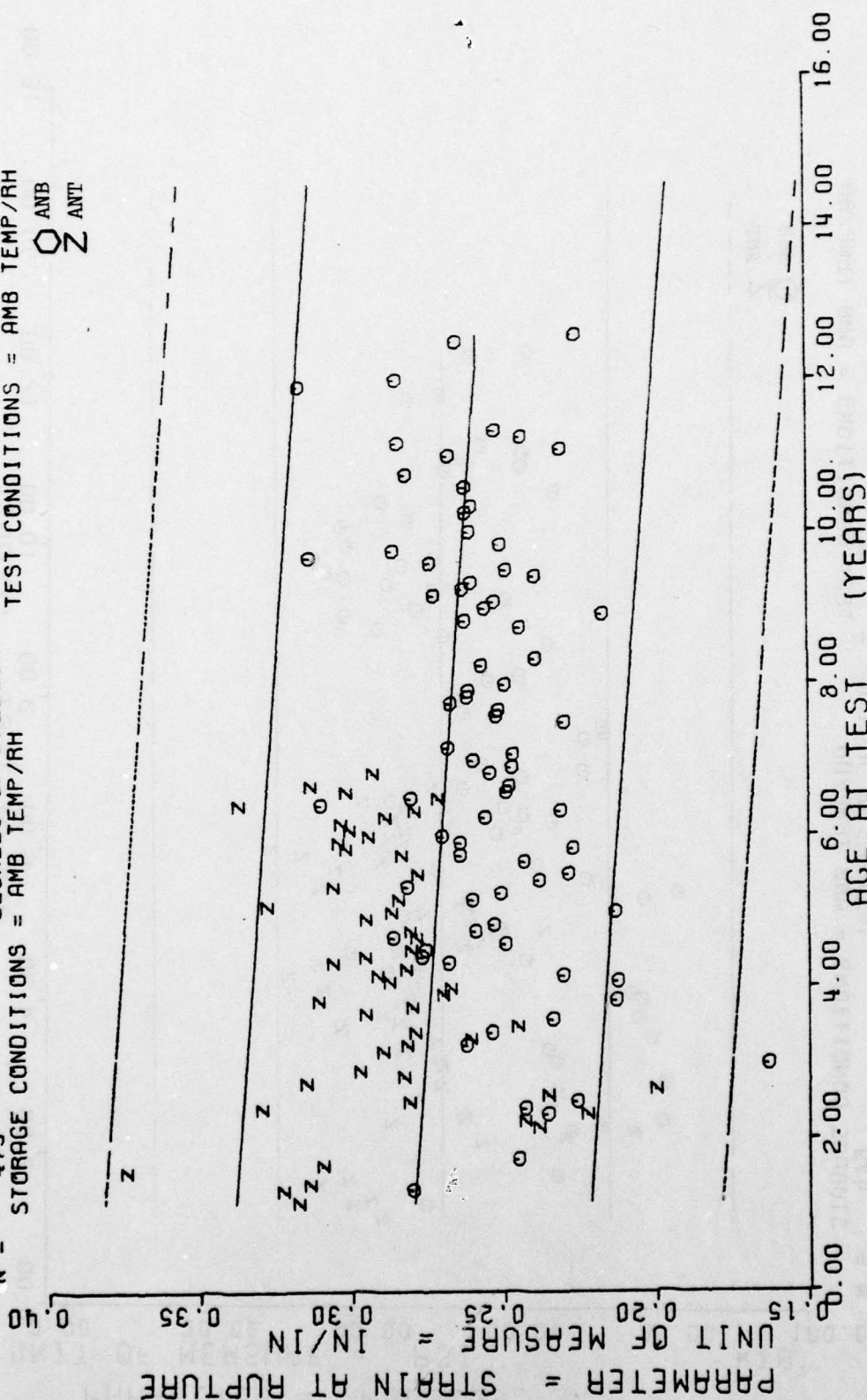


ANB 3066 PROPLINT (ANT & ANB UNLND, P POLYMER) TENSILE SM, 1750 IN/MIN, 600 PSI

Figure 5-31

$Y = ((+2.8226340E-01) + (-1.6398026E-04) \times X)$   
 $F = +1.2332452E+01$  SIGNIFICANCE OF F = SIGNIFICANT  
 $R = -1.5875328E-01$  SIGNIFICANCE OF R = SIGNIFICANT  
 $t = +3.5117592E+00$  SIGNIFICANCE OF t = SIGNIFICANT  
 $N = 479$  DEGREES OF FREEDOM = 477  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH

ANB  
 Z ANT



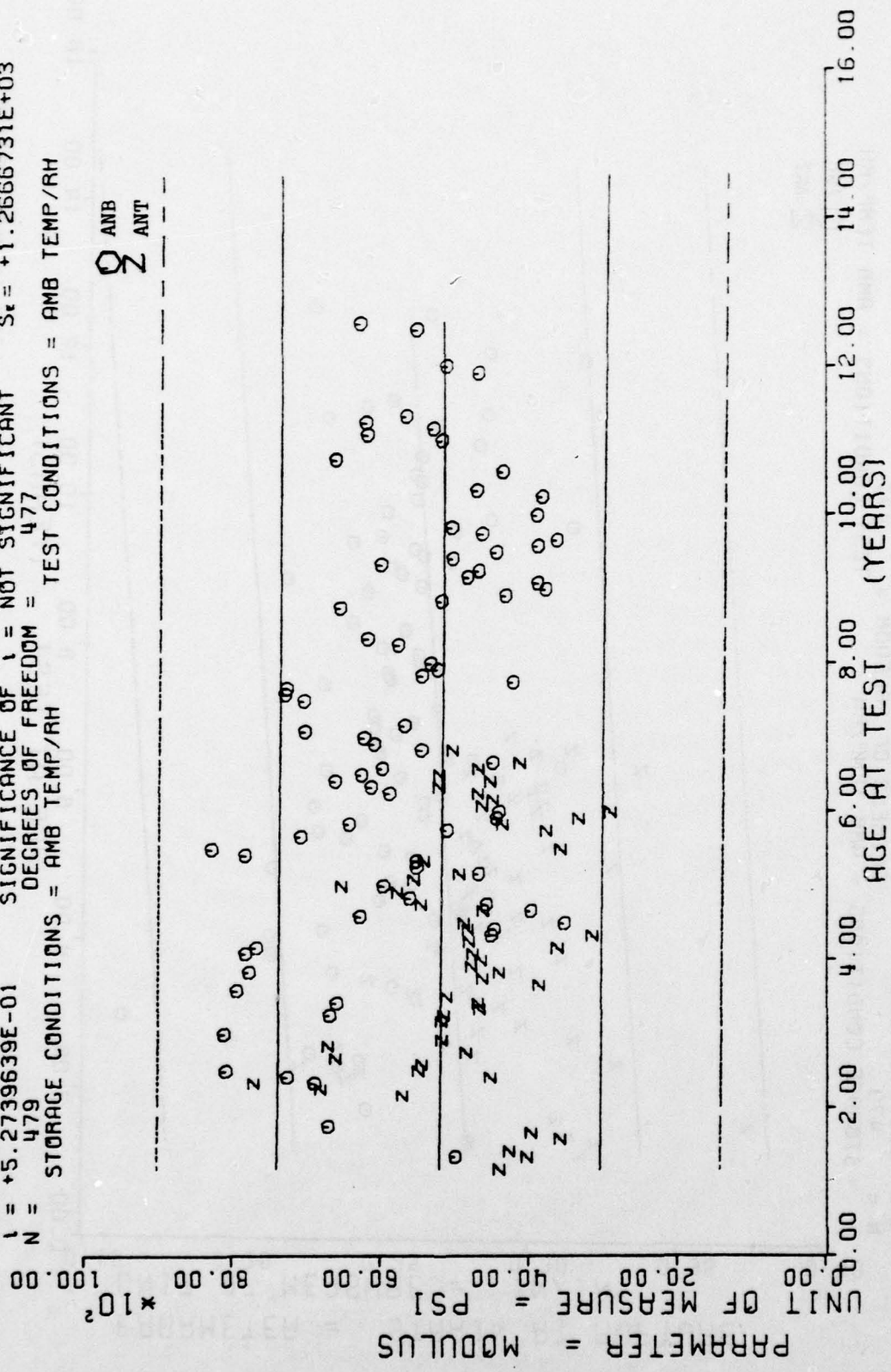
ANB 3066 PROPLNT (ANT & ANB UNLND, P POLYMER) TENSILE ER, 1750 IN/MIN, 600 PSI

Figure 5-32



$Y = ((+5.2293743E+03) + (-9.1938305E-01) * X)$   
 $F = +2.7814695E-01$  SIGNIFICANCE OF F = NOT SIGNIFICANT  
 $R = -2.4140784E-02$  SIGNIFICANCE OF R = NOT SIGNIFICANT  
 $1 = +5.2739639E-01$  SIGNIFICANCE OF 1 = NOT SIGNIFICANT  
 $N = 479$  DEGREES OF FREEDOM = 477  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH

ANB  
 ANT



ANB 3066 PROPLNT (ANT & ANB UNLND, P POLYMER) TENSILE MOD, 1750 IN/MIN, 600 PS

Figure 5-33

\*\*\* SAMPLE SIZE SUMMARY \*\*\*

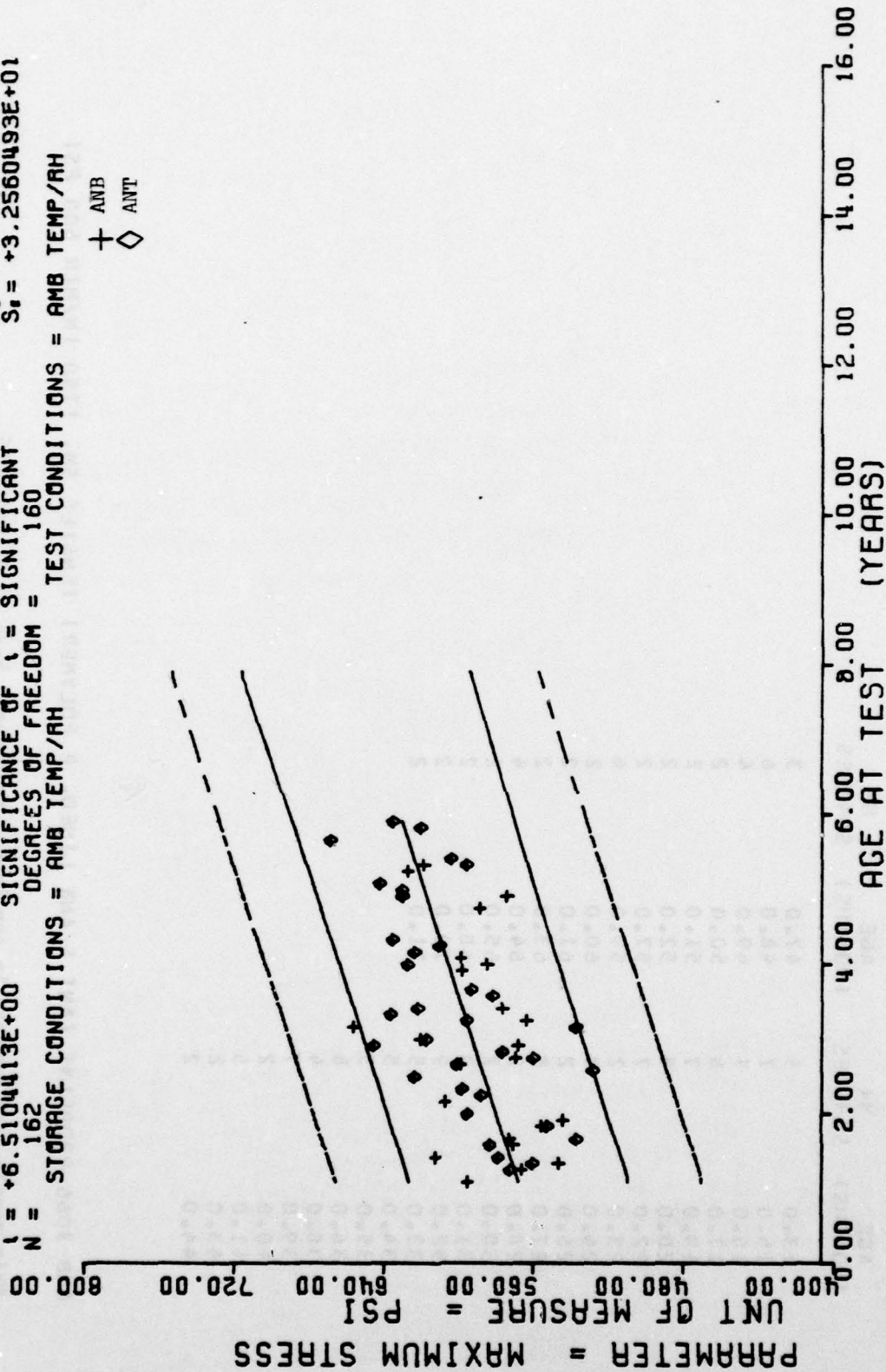
AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES
13.0	3	47.0	3
15.0	7	48.0	6
16.0	9	49.0	4
17.0	6	50.0	2
19.0	7	51.0	2
20.0	5	52.0	2
22.0	7	57.0	2
23.0	2	59.0	4
24.0	3	60.0	2
26.0	2	61.0	2
27.0	8	63.0	2
28.0	2	64.0	4
30.0	2	65.0	2
31.0	3	68.0	2
32.0	9	70.0	2
33.0	5	71.0	2
34.0	5		
35.0	3		
36.0	8		
38.0	4		
39.0	7		
40.0	2		
41.0	5		
43.0	2		
44.0	2		

ANB 3066 PROPLLYT (ANT & ANB LINED, P POLYMER) TENSILE SM, 1750 IN/MIN 600 PSI

This sample size summary is applicable to figures 5-34, 5-35 and 5-36

$F = +4.2385046E+01$  SIGNIFICANCE OF F = SIGNIFICANT  
 $R = +4.5763619E-01$  SIGNIFICANCE OF R = SIGNIFICANT  
 $t = +6.5104413E+00$  SIGNIFICANCE OF t = SIGNIFICANT  
 $N = 162$  DEGREES OF FREEDOM = 160  
 STORAGE CONDITIONS = AMB TEMP/AH TEST CONDITIONS = AMB TEMP/AH

+ ANB  
 ◇ ANT

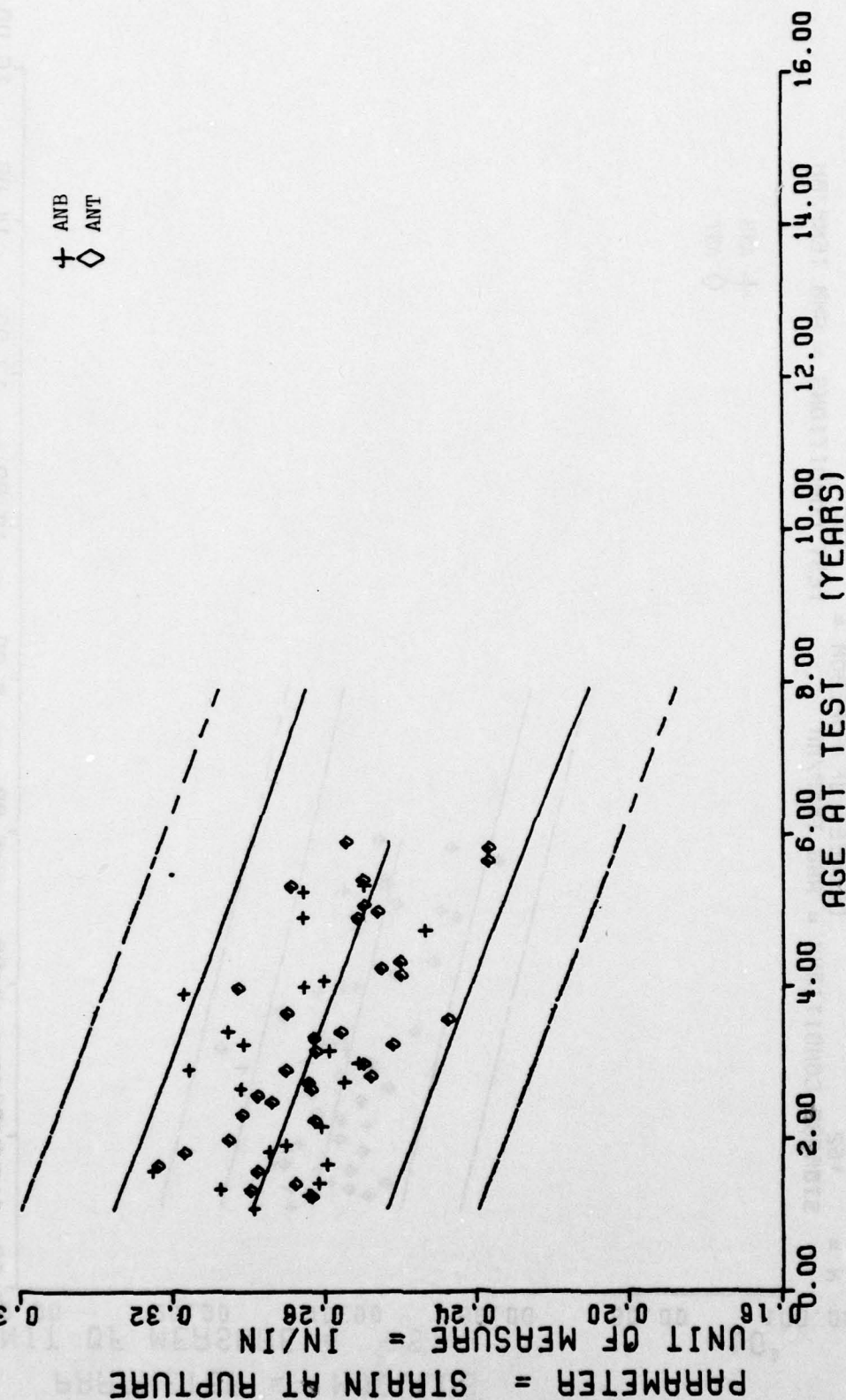


ANB 3066 PROPELLANT (ANT & ANB LINED, P POLYMER) TENSILE SM, 1750 IN/MIN 600 PSI

Figure 5-34



$Y = ((+3.077899E-01) + (-6.3343609E-04) \times X)$   
 $F = +3.7969257E+01$  SIGNIFICANCE OF F = SIGNIFICANT  
 $R = -4.3905287E-01$  SIGNIFICANCE OF R = SIGNIFICANT  
 $t = +6.1619199E+00$  SIGNIFICANCE OF t = SIGNIFICANT  
 $N = 161$  DEGREES OF FREEDOM = 159  
 STORAGE CONDITIONS = AMB TEMP/AH TEST CONDITIONS = AMB TEMP/AH

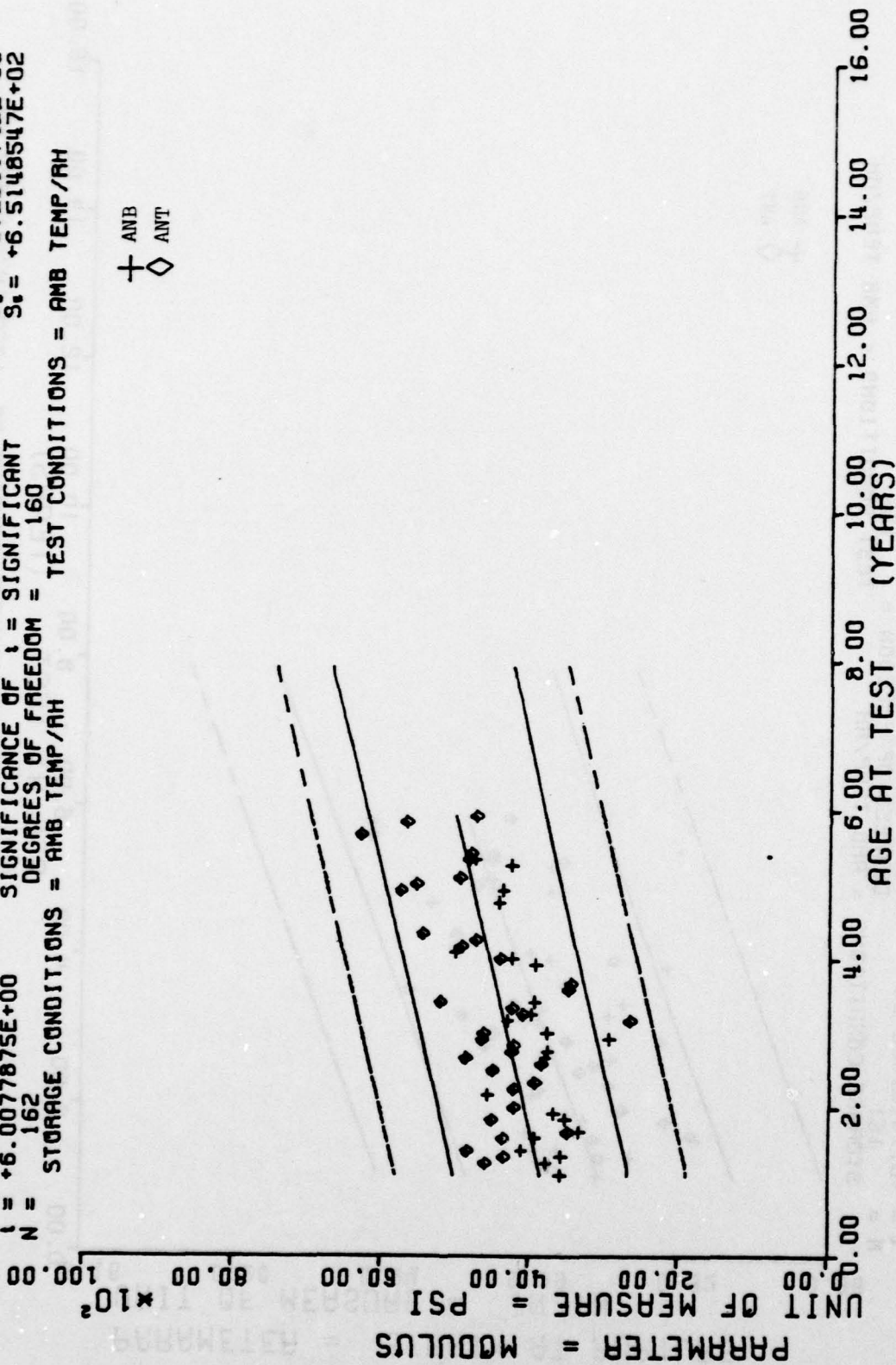


ANB 3066 PROPLANT (ANT & ANB LINED, P POLYMER) TENSILE EA, 1750 IN/MIN 600 PSI

Figure 5-35

$F = +3.6093511E+01$   
 $R = +4.2902534E-01$   
 $t = +6.0077875E+00$   
 $N = 162$   
 $Y = ((+3.5844824E+03) + (+1.9712597E+01) * X)$   
 SIGNIFICANCE OF F = SIGNIFICANT  
 SIGNIFICANCE OF R = SIGNIFICANT  
 SIGNIFICANCE OF t = SIGNIFICANT  
 DEGREES OF FREEDOM = 160  
 STORAGE CONDITIONS = AMB TEMP/RH  
 TEST CONDITIONS = AMB TEMP/RH

+ ANB  
 ◇ ANT



ANB 3066 PROPLINT (ANT & ANB LINED, P POLYMER) TENSILE MOD, 1750 IN/MIN 600 PSI

Figure 5-36

\*\*\* SAMPLE SIZE SUMMARY \*\*\*

AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP
16	3	70	9
17	4	71	6
19	5	72	6
20	5	73	3
21	5	75	3
23	5	76	3
24	5	80	3
25	5	81	3
26	5	82	6
27	4	83	3
29	5	84	3
30	4	88	3
31	5	89	3
32	5	90	6
44	3	93	6
47	3	94	3
50	3	95	6
53	3	96	3
55	5	104	6
56	6	107	6
60	6		
62	3		
64	3		
66	3		
69	3		

ANB 3066 PROPELLANT(ANA) TENSILE MAX STRESS. 1750 IN/MIN. 600 PSI. 77 DEG UNILND

This sample size summary is applicable to figures 5-37, 5-38 and 5-39



$Y = ((+4.1796172E+02) + (+1.1461953E+00) \times X)$   
 $F = +6.9125054E+01$  SIGNIFICANCE OF F = SIGNIFICANT  $G = +6.3072430E+01$   
 $R = +5.1255266E-01$  SIGNIFICANCE OF R = SIGNIFICANT  $S_0 = +1.3786003E-01$   
 $t = +8.3141959E+00$  SIGNIFICANCE OF t = SIGNIFICANT  $S_1 = +5.4296909E+01$   
 $N = 196$  DEGREES OF FREEDOM = 194  
 STORAGE CONDITIONS = AMB TEMP/AH TEST CONDITIONS = 77 DEG F, AMB RH

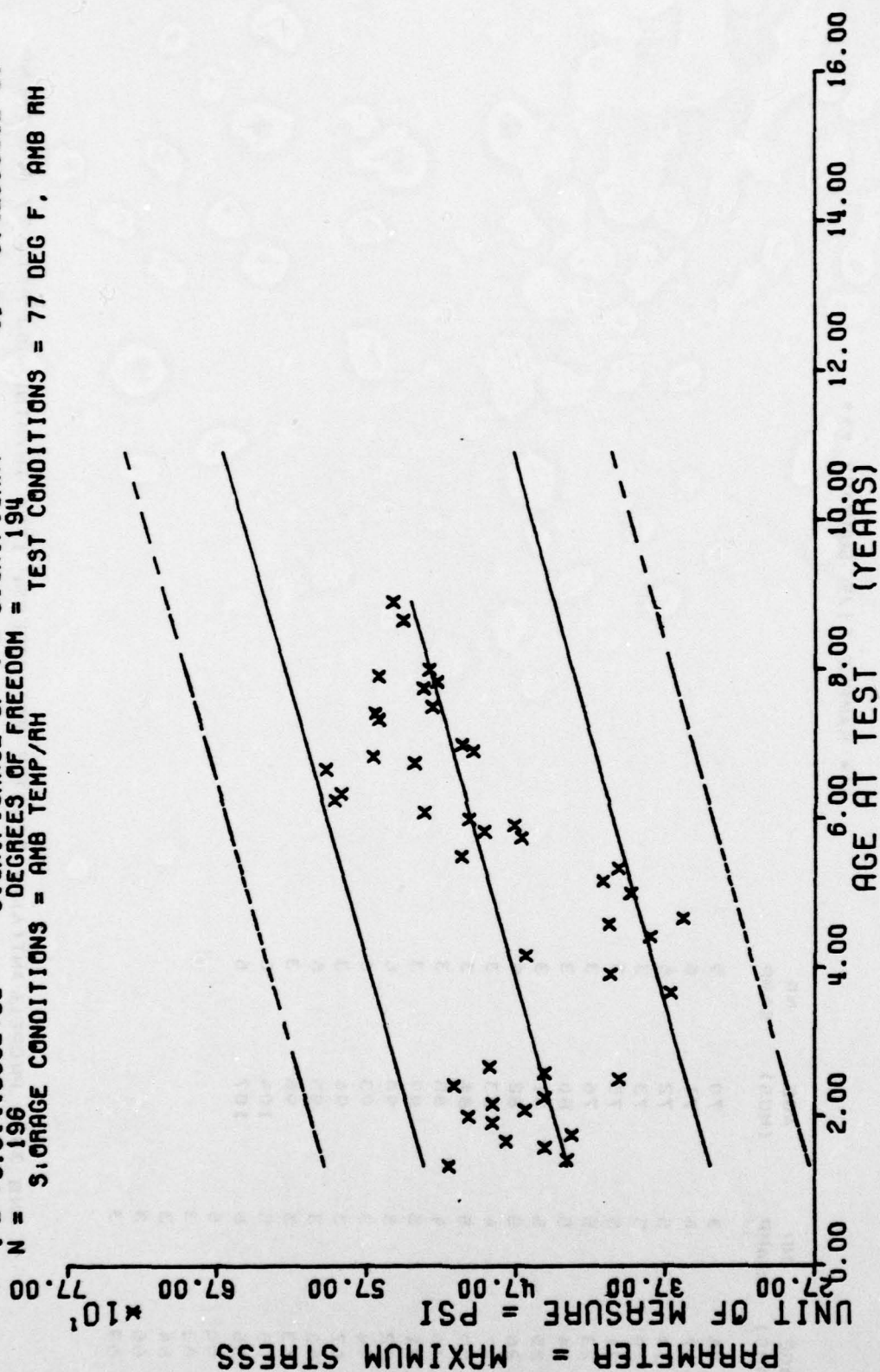
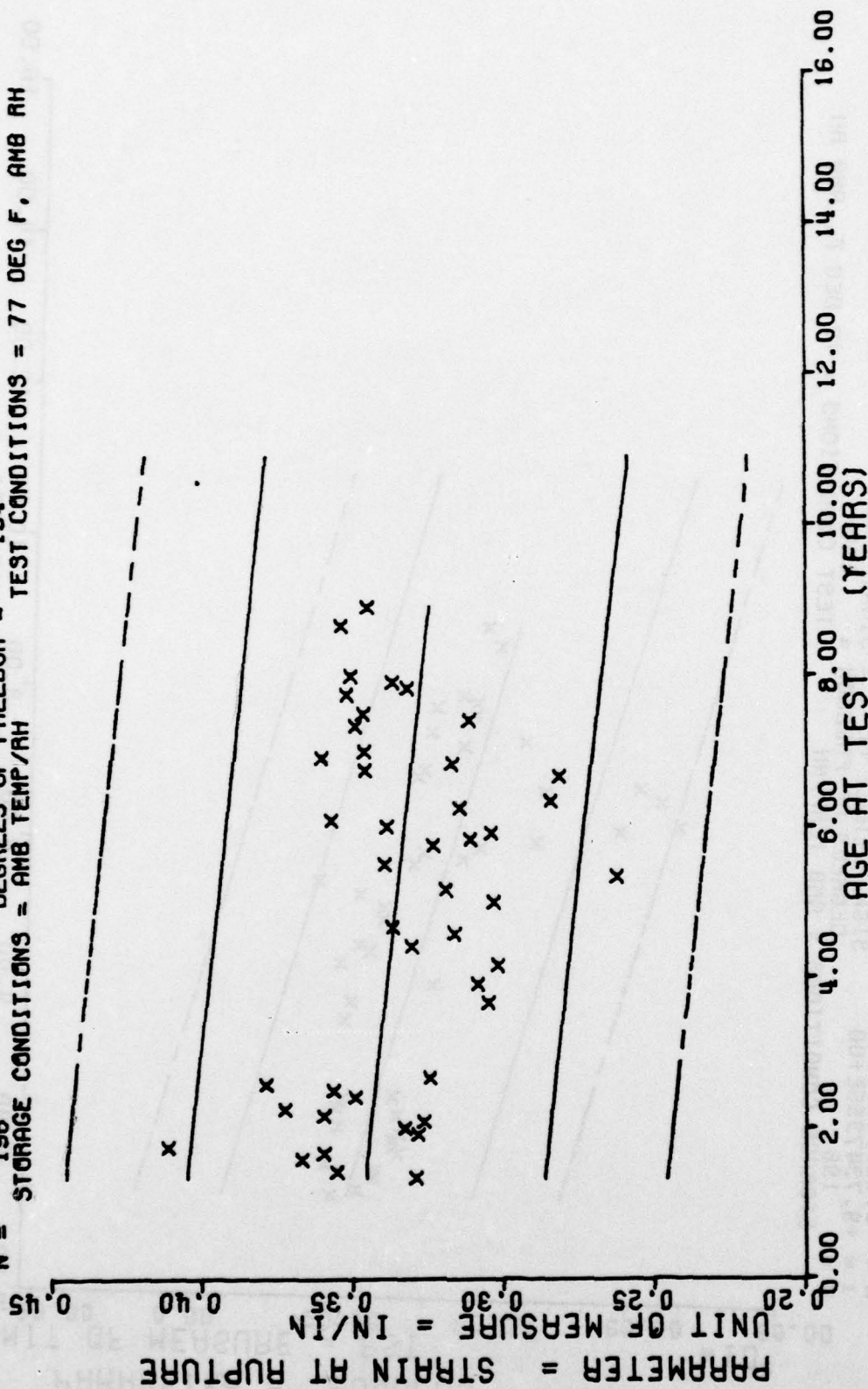


Figure 5-37

$Y = ((+3.4970960E-01) + (-2.3937439E-04) * X)$   
 $F = +8.0771211E+00$  SIGNIFICANCE OF F = SIGNIFICANT  $\sigma_f = +3.3769705E-02$   
 $R = -1.9992620E-01$  SIGNIFICANCE OF R = SIGNIFICANT  $S_e = +8.4226602E-05$   
 $t = +2.8420276E+00$  SIGNIFICANCE OF t = SIGNIFICANT  $S_t = +3.3173095E-02$   
 $N = 196$  DEGREES OF FREEDOM = 194  
 STORAGE CONDITIONS = AMB TEMP/AH TEST CONDITIONS = 77 DEG F, AMB RH



$Y = ((+1.9293505E+03) + (+2.3221127E+01) \times X)$   
 $F = +9.4765077E+01$  SIGNIFICANCE OF F = SIGNIFICANT  $G_1 = +1.1432754E+03$   
 $R = +5.7286438E-01$  SIGNIFICANCE OF R = SIGNIFICANT  $S_1 = +2.3853886E+00$   
 $t = +9.7347355E+00$  SIGNIFICANCE OF t = SIGNIFICANT  $S_2 = +9.3949801E+02$   
 $N = 196$  DEGREES OF FREEDOM = 194  
 STORAGE CONDITIONS = AMB TEMP/AH TEST CONDITIONS = 77 DEG F, AMB RH

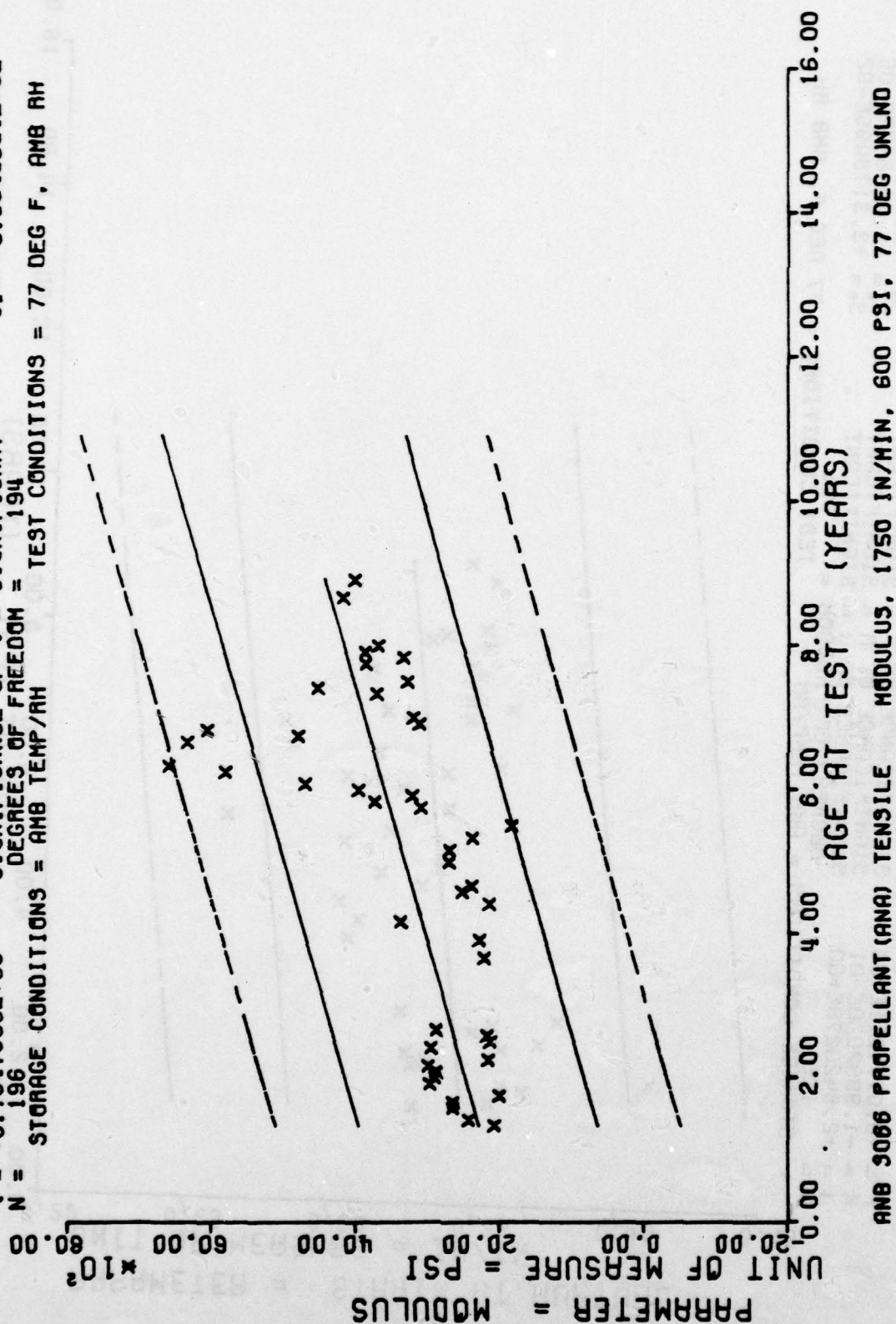


Figure 5-39



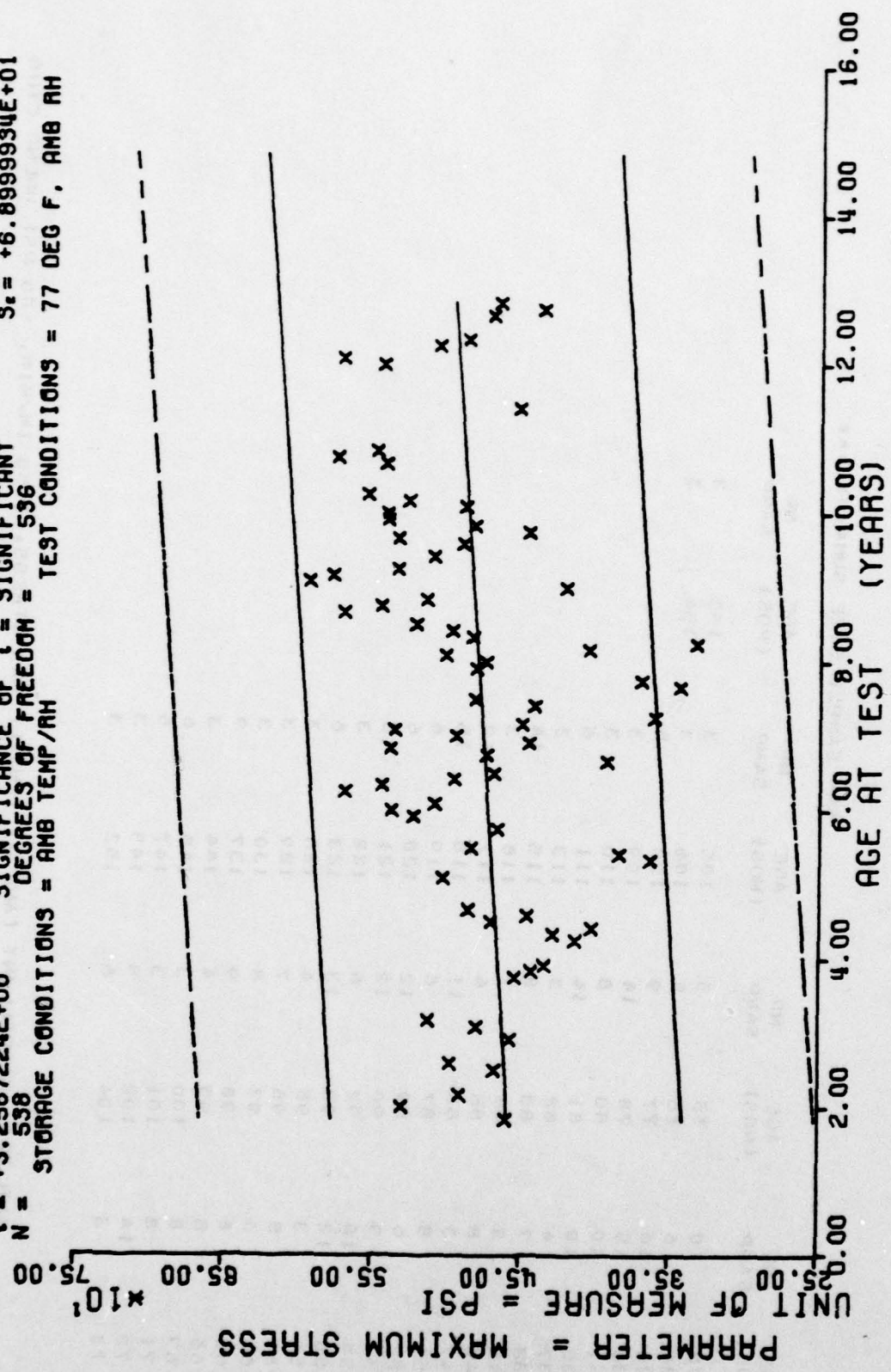
\*\*\* SAMPLE SIZE SUMMARY \*\*\*

AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP
22	10	75	5	105	3	153	3
24	6	76	5	106	3	154	3
26	16	77	9	108	5		
30	15	78	14	109	3		
31	10	80	8	110	3		
35	10	81	14	111	6		
37	4	82	3	113	3		
38	7	83	8	115	14		
45	3	84	7	116	3		
46	8	85	6	117	12		
47	3	86	11	118	15		
51	5	87	6	119	6		
52	6	89	12	120	6		
53	3	90	12	121	15		
54	16	92	6	122	3		
55	12	93	13	123	6		
56	3	95	4	128	3		
61	5	96	7	129	3		
64	3	97	8	130	3		
65	6	98	9	137	9		
66	5	99	4	144	3		
69	8	100	3	145	6		
71	8	101	3	147	6		
72	14	102	9	149	3		
73	3	104	6	152	3		

ANR 3065 PROPELLANT (ANR G) TENSILE MAX STRESS, 1750 IN/MIN. 400 PSI UNLND CTJUS

This sample size summary is applicable to figures 5-40, 5-41 and 5-42

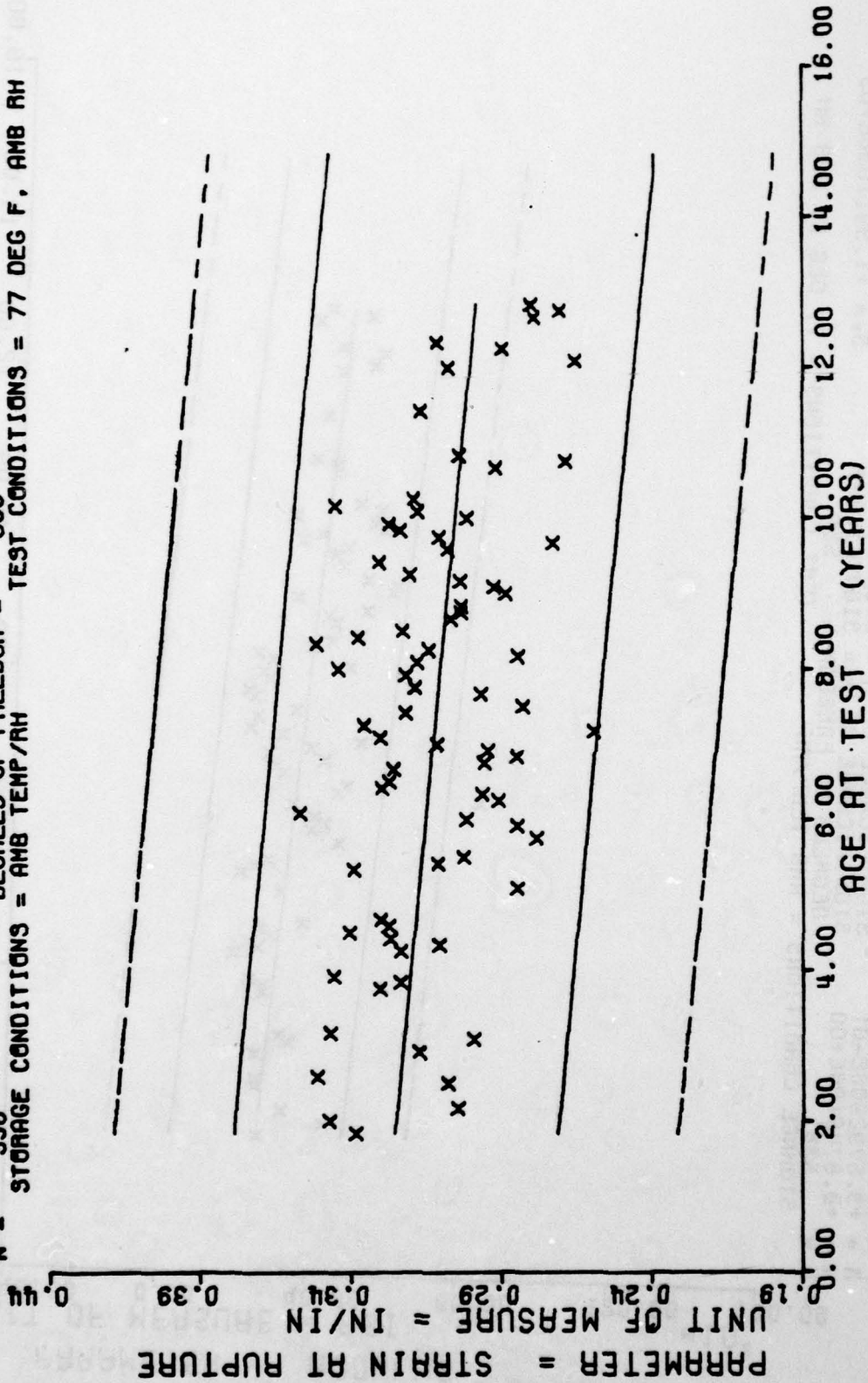
$Y = ((+4.5251695E+02) + (+2.9047793E-01) \times X)$   
 $F = +1.0608241E+01$  SIGNIFICANCE OF F = SIGNIFICANT  $\sigma = +6.9614359E+01$   
 $R = +1.3929754E-01$  SIGNIFICANCE OF R = SIGNIFICANT  $S_e = +8.9193336E-02$   
 $t = +3.2567224E+00$  SIGNIFICANCE OF t = SIGNIFICANT  $S_e = +6.8999934E+01$   
 $N = 538$  DEGREES OF FREEDOM = 536  
 STORAGE CONDITIONS = AMB TEMP/AM TEST CONDITIONS = 77 DEG F, AMB RH



ANB 3066 PROPELLANT (ANB G) TENSILE MAX STRESS, 1750 IN/MIN, 600 PSI UNLND CTNS

Figure 5-40

$Y = ((+3.2965967E-01) + (-2.0817517E-04) \times X)$   
 $F = +2.6780768E+01$  SIGNIFICANCE OF F = SIGNIFICANT  $\alpha = +3.1857828E-02$   
 $R = -2.1814330E-01$  SIGNIFICANCE OF R = SIGNIFICANT  $S_0 = +4.0226979E-05$   
 $t = +5.1750138E+00$  SIGNIFICANCE OF t = SIGNIFICANT  $S_1 = +3.1119577E-02$   
 $N = 538$  DEGREES OF FREEDOM = 536  
 STORAGE CONDITIONS = AMB TEMP/AMB TEST CONDITIONS = 77 DEG F, AMB RH

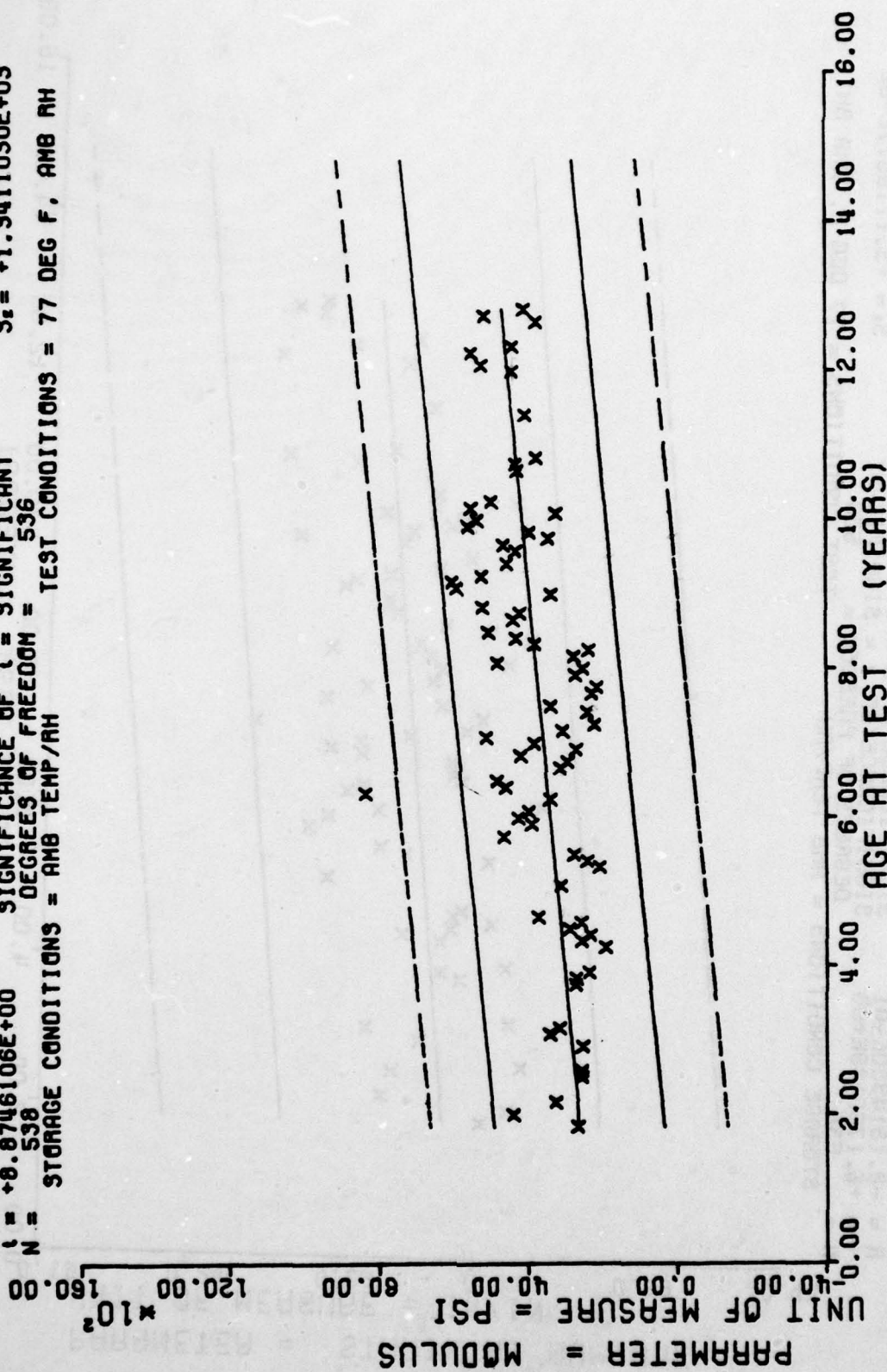


AMB 3066 PROPELLANT (AMB, G) TENSILE STN • RUPT. 1750 IN/MIN, 600 PSI, UNLND CT

Figure 5-41



$Y = ((+2.3103939E+03) + (+1.5384918E+01) * X)$   
 $F = +7.8758719E+01$  SIGNIFICANCE OF F = SIGNIFICANT  $G = +1.4949188E+03$   
 $R = +3.5792906E-01$  SIGNIFICANCE OF R = SIGNIFICANT  $S_0 = +1.7935879E+00$   
 $L = +8.8746106E+00$  SIGNIFICANCE OF L = SIGNIFICANT  $S_2 = +1.9411030E+03$   
 $N = 538$  DEGREES OF FREEDOM = 536  
 STORAGE CONDITIONS = AMB TEMP/AH TEST CONDITIONS = 77 DEG F, AMB RH



AMB 3066 PROPELLANT (AMB, G) TENSILE MODULUS, 1750 IN/MIN, 600 PSI, UNLND CTNS

Figure 5-42

\*\*\*\* LINEAR REGRESSION ANALYSIS \*\*\*\*

\*\*\* ANALYSIS OF TIME SERIES \*\*\*

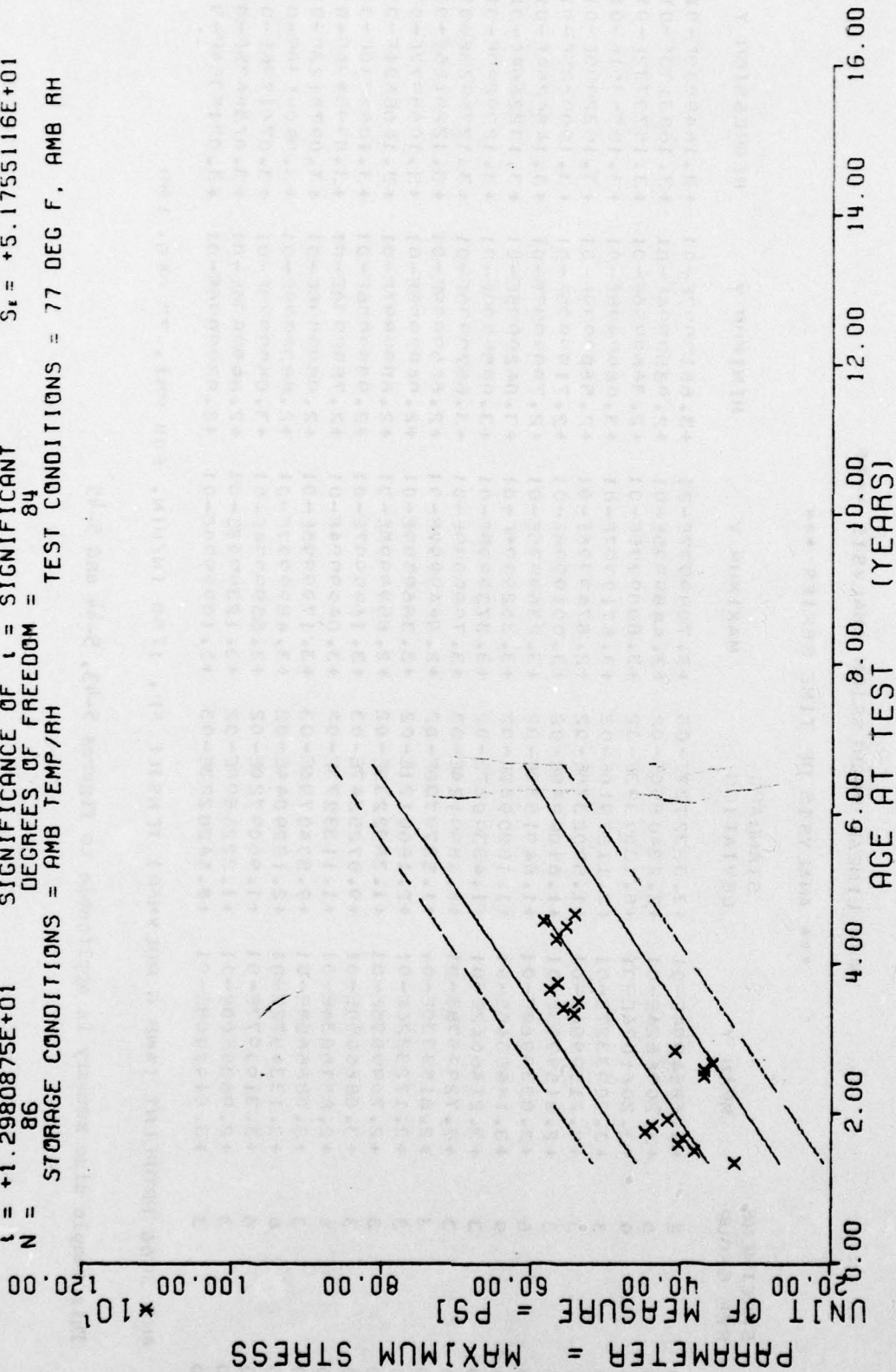
AGE (MONTHS)	SPECIMENS PER GROUP	MEAN Y	STANDARD DEVIATION	MAXIMUM Y	MINIMUM Y	REGRESSION Y
16.0	2	+3.6854994E-01	+3.3232727E-03	+3.7089997E-01	+3.6610007E-01	+3.1649839E-01
19.0	6	+3.2096624E-01	+2.2240856E-02	+3.4480005E-01	+2.0350004E-01	+3.1603103E-01
19.0	9	+3.2061076E-01	+5.1359393E-02	+3.8009995E-01	+2.3460009E-01	+3.1579732E-01
20.0	3	+3.3093327E-01	+2.1167910E-02	+3.4719997E-01	+3.0690008E-01	+3.1556361E-01
21.0	3	+2.7159994E-01	+1.5702375E-02	+2.8749996E-01	+2.5600009E-01	+3.1532000E-01
22.0	3	+2.8159993E-01	+1.6109949E-02	+3.0019998E-01	+2.7190005E-01	+3.1509625E-01
23.0	6	+3.0339968E-01	+1.6491536E-02	+3.2360005E-01	+2.7090007E-01	+3.1486254E-01
30.0	9	+3.1868845E-01	+1.1590982E-02	+3.3529999E-01	+3.0420005E-01	+3.1322664E-01
31.0	3	+3.2146662E-01	+1.4330027E-02	+3.3730005E-01	+3.0050000E-01	+3.1290200E-01
32.0	3	+3.7299978E-01	+6.1899124E-03	+3.7099990E-01	+3.6820006E-01	+3.1275029E-01
34.0	3	+2.8153330E-01	+1.5270708E-02	+2.9049999E-01	+2.6460009E-01	+3.1220186E-01
40.0	3	+3.1723326E-01	+2.1860121E-02	+3.3869999E-01	+2.0400007E-01	+3.1088072E-01
41.0	3	+2.7699995E-01	+1.3892233E-02	+2.8590005E-01	+2.6000007E-01	+3.1065601E-01
42.0	3	+3.0866658E-01	+9.0725247E-03	+3.1699007E-01	+2.0900006E-01	+3.1042230E-01
44.0	6	+2.8816634E-01	+1.1133273E-02	+3.0490004E-01	+2.7500005E-01	+3.0995494E-01
45.0	3	+3.0866658E-01	+9.5040796E-03	+3.1799005E-01	+2.9800006E-01	+3.0972123E-01
52.0	6	+3.1334972E-01	+2.1829044E-02	+3.4890007E-01	+2.8830009E-01	+3.0808538E-01
54.0	6	+3.3199977E-01	+1.9609720E-02	+3.5590004E-01	+3.0600003E-01	+3.0761706E-01
55.0	3	+2.9836660E-01	+1.2226500E-02	+3.1239998E-01	+2.8000006E-01	+3.0738425E-01
56.0	3	+3.0199998E-01	+8.5428223E-03	+3.1099008E-01	+2.9300006E-01	+3.0715034E-01

5 1 60

ANB 3066 PROPLNT (ANB G POLYMFR) TENSILE FR, 1750 IN/MIN, 600 PSI, 77 DEG. LND

This sample size summary is applicable to figures 5-43, 5-44 and 5-45

$Y = ((+2.7690342E+02) + (+5.4542015E+00) * X)$   
 F = +1.6850311E+02 SIGNIFICANCE OF F = SIGNIFICANT  $G_1 = +8.9202535E+01$   
 R = +8.1690320E-01 SIGNIFICANCE OF R = SIGNIFICANT  $S_0 = +4.2017210E-01$   
 t = +1.2980875E+01 SIGNIFICANCE OF t = SIGNIFICANT  $S_1 = +5.1755116E+01$   
 N = 86 DEGREES OF FREEDOM = 84  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 77 DEG F, AMB RH

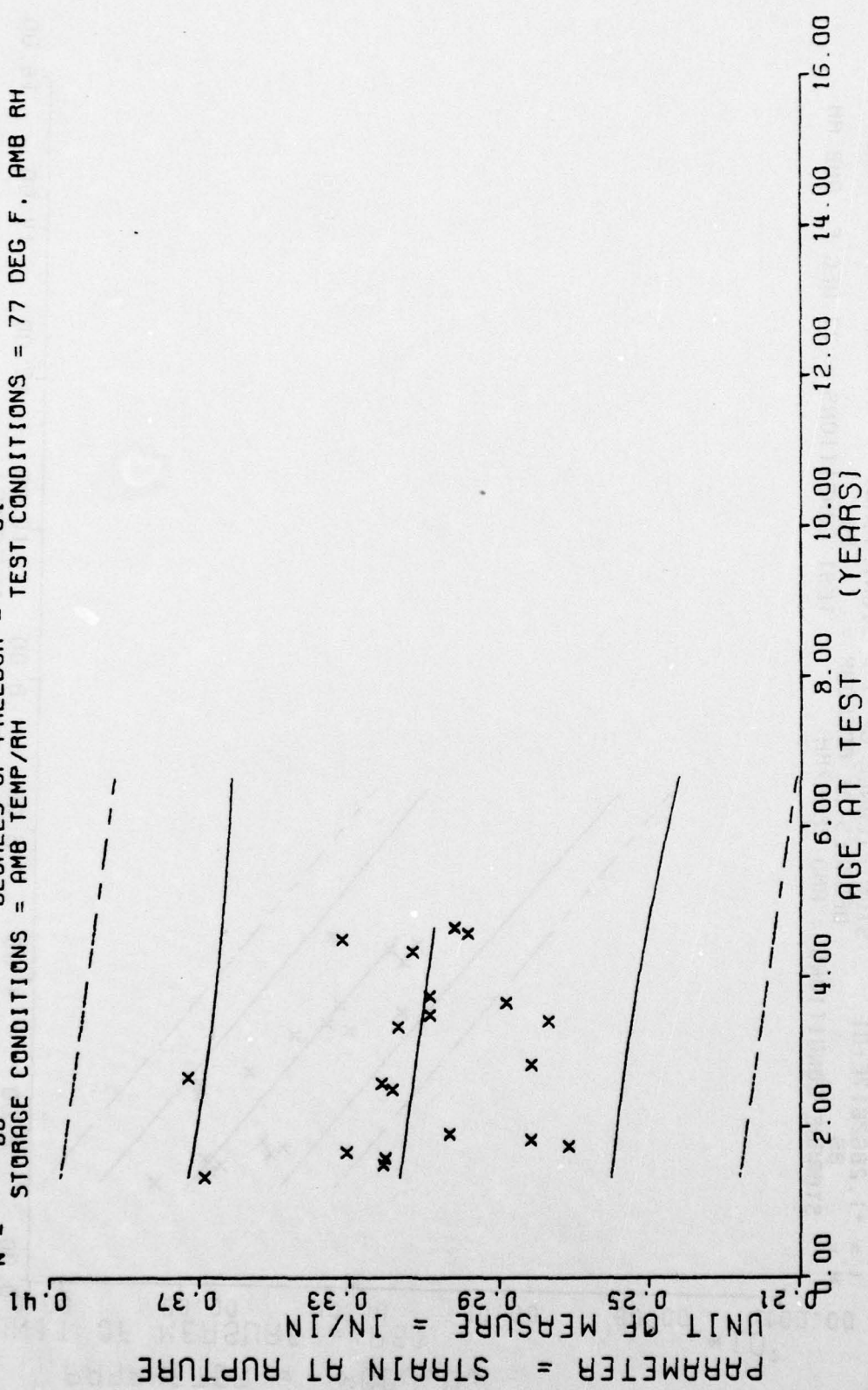


ANB 3066 PROPELLANT (ANB G POLYMER) TENSILE SM, 1750 IN/MIN, 600 PSI, 77 DEG, LND

Figure 5-43



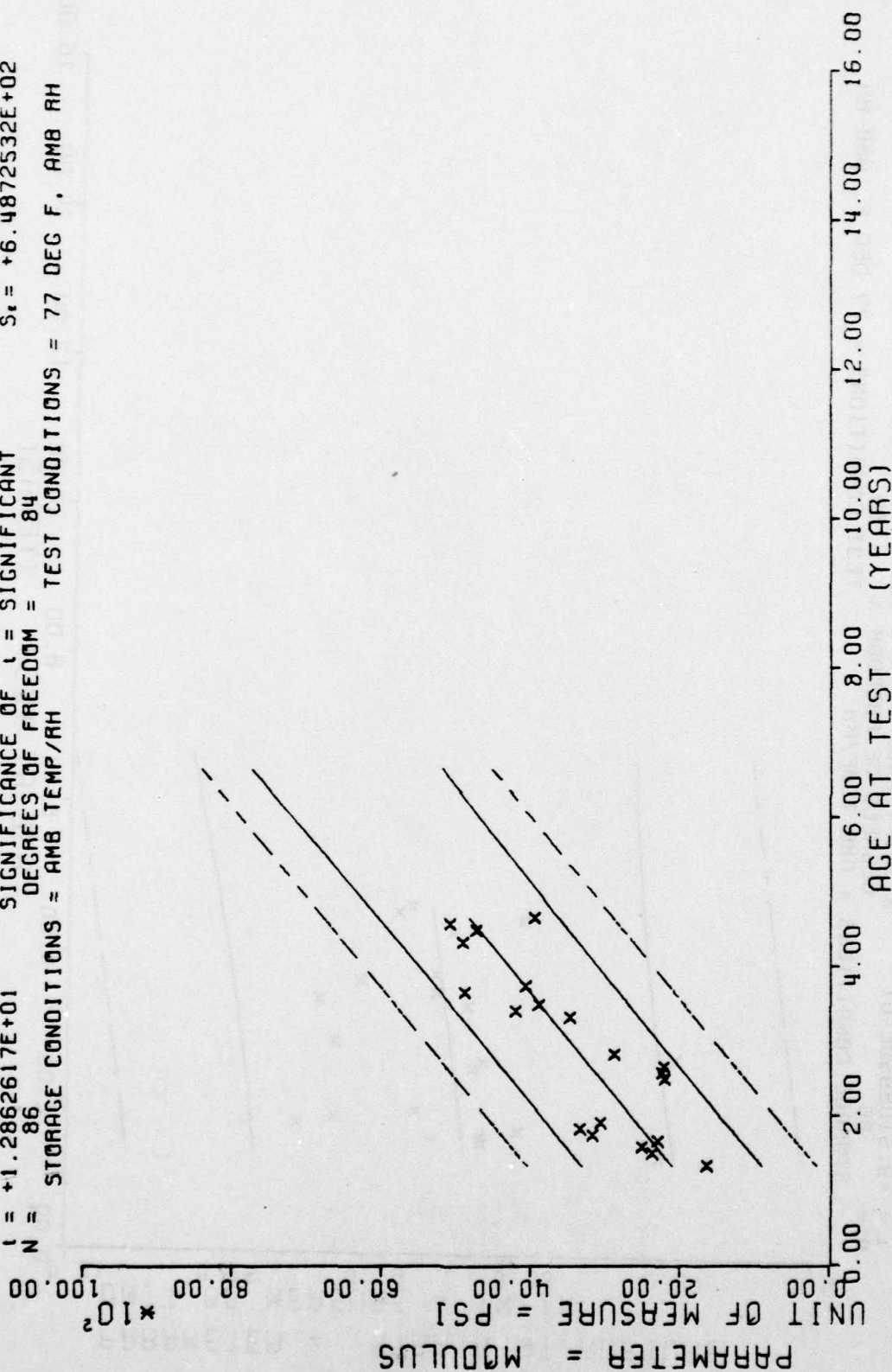
$Y = ((+3.2023757E-01) + (-2.3369598E-04) * X)$   
 $F = +9.0451434E-01$  SIGNIFICANCE OF F = NOT SIGNIFICANT  $G = +3.0250010E-02$   
 $R = -1.0321488E-01$  SIGNIFICANCE OF R = NOT SIGNIFICANT  $S_a = +2.4572170E-04$   
 $t = +9.5105959E-01$  SIGNIFICANCE OF t = NOT SIGNIFICANT  $S_t = +3.0267015E-02$   
 $N = 86$  DEGREES OF FREEDOM = 84  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 77 DEG F, AMB RH



ANB 3066 PROPLNT (ANB G POLYMER) TENSILE ER, 1750 IN/MIN, 600 PSI, 77 DEG, LND

Figure 5-44

$Y = ((+1.0397754E+03) + (+6.7742953E+01) * X)$   
 $F = +1.6544692E+02$  SIGNIFICANCE OF F = SIGNIFICANT  $G_1 = +1.1113234E+03$   
 $R = +8.1440470E-01$  SIGNIFICANCE OF R = SIGNIFICANT  $S_0 = +5.2666538E+00$   
 $t = +1.2862617E+01$  SIGNIFICANCE OF t = SIGNIFICANT  $S_t = +6.4872532E+02$   
 $N = 86$  DEGREES OF FREEDOM = 84  
 STORAGE CONDITIONS = AMB TEMP/AM TEST CONDITIONS = 77 DEG F, AMB RH



ANB 3066 PROPLANT (ANB C POLYMER) TENSILE MOD 1750 IN/MIN 77 DEG 600 PSI LINED

Figure 5-45

\*\*\* SAMPLE SIZE SUMMARY \*\*\*

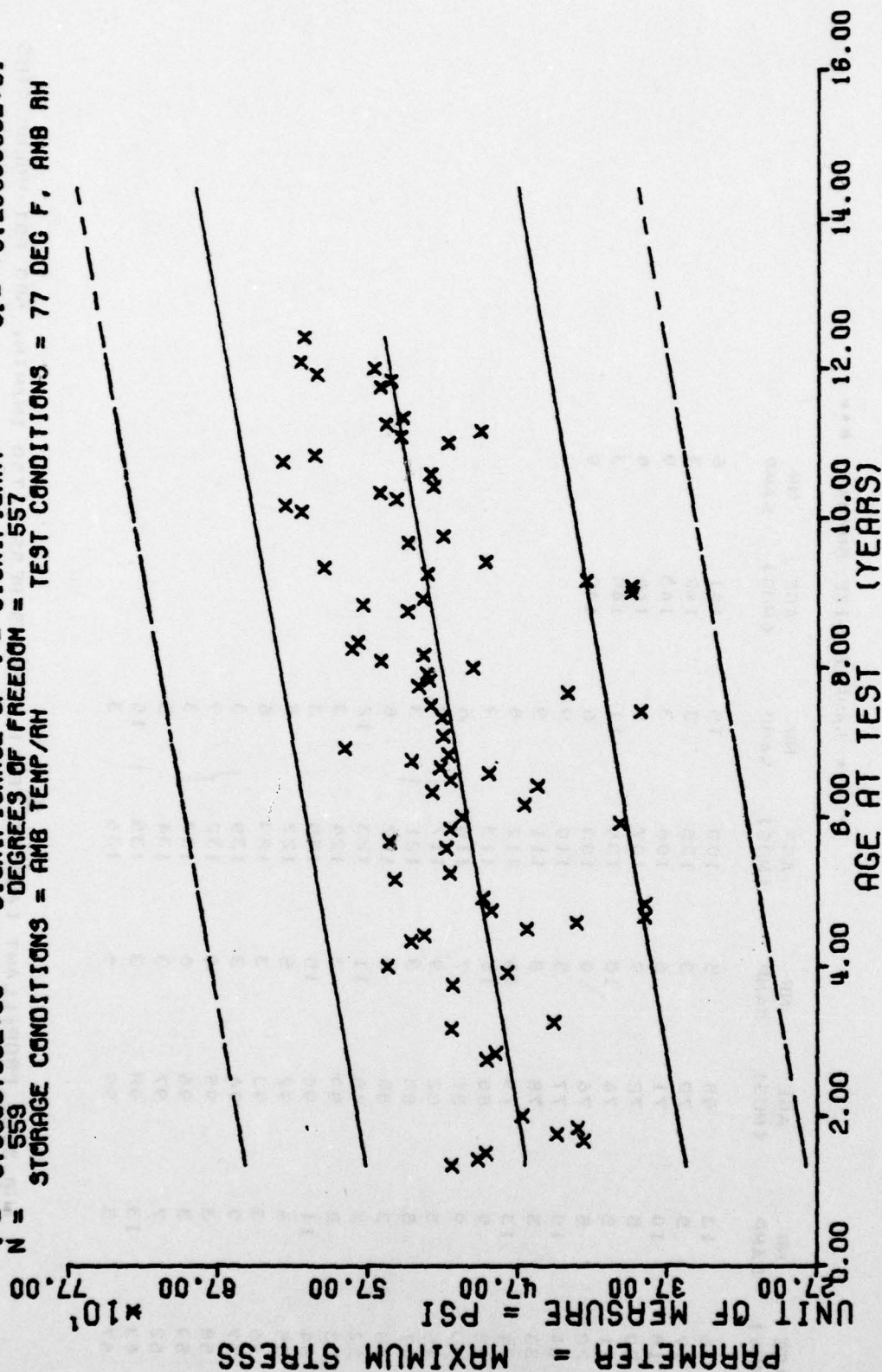
AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP
16	13	68	5	100	15	141	6
17	5	70	3	105	3	142	3
18	10	71	6	106	3	143	9
20	5	72	9	107	8	144	6
21	5	74	10	108	11	145	3
22	5	76	9	109	6	149	9
24	10	77	5	110	9		
33	5	78	8	111	9		
34	13	79	16	112	6		
38	9	80	14	113	9		
39	9	81	7	116	6		
45	5	82	9	117	9		
47	5	83	3	121	3		
48	3	85	8	122	6		
52	3	88	11	123	12		
53	8	89	3	124	3		
54	11	90	15	125	3		
55	6	92	5	127	8		
56	3	93	3	129	6		
57	9	94	3	130	3		
58	3	95	6	132	3		
59	3	96	6	133	3		
62	7	97	3	134	6		
63	13	98	3	135	15		
67	5	99	6	136	3		

ANR 3066 PROPELLANT (ANR GP TENSILE MAX STRESS, 1750 IN/MIN, 500 PSI UNLND CTHIS

This sample size summary is applicable to figures 5-46, 5-47 and 5-48



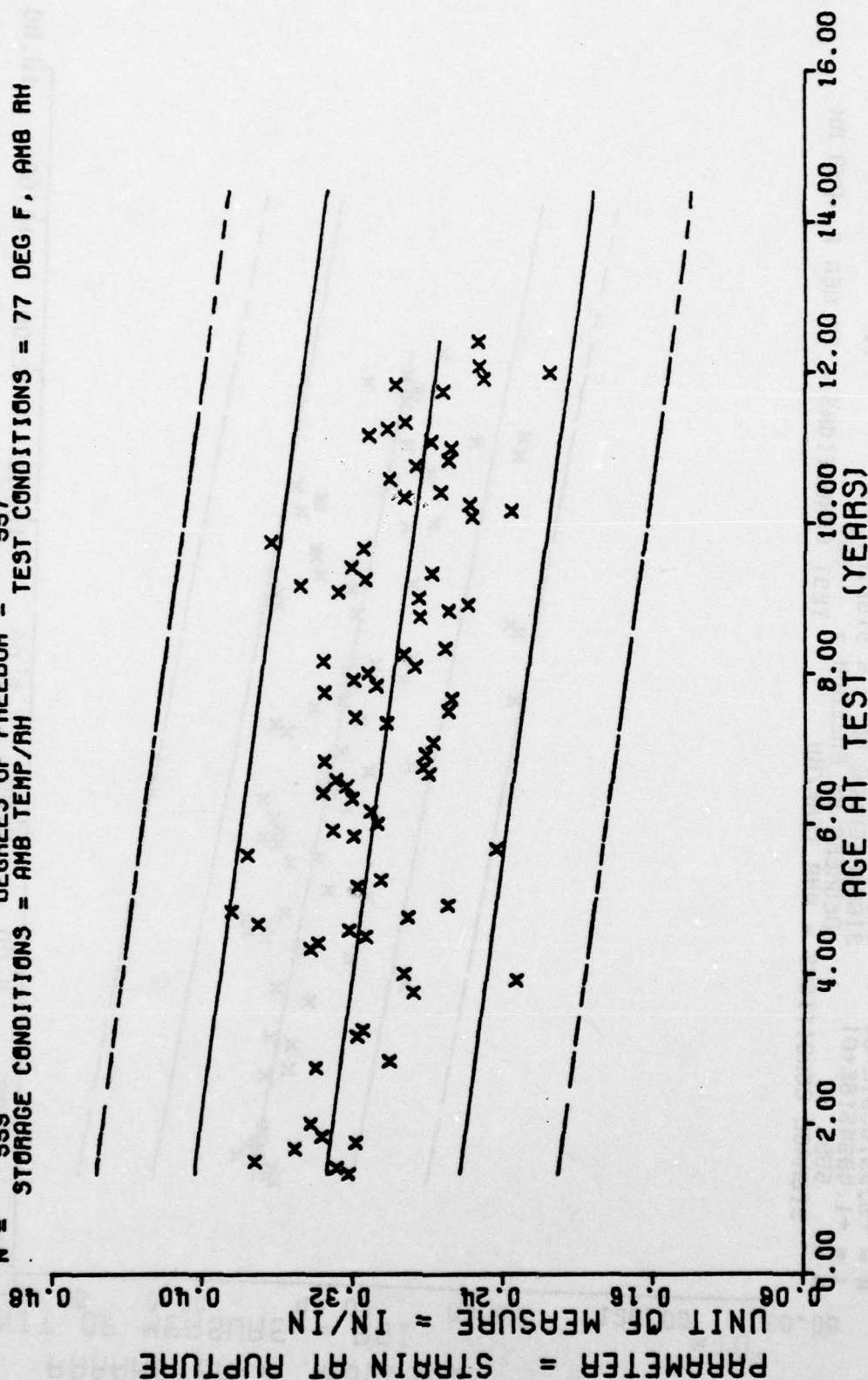
$Y = ((+4.5296168E+02) + (+7.1915882E-01) * X)$   
 $F = +9.7888840E+01$  SIGNIFICANCE OF F = SIGNIFICANT  $\sigma_f = +6.7824758E+01$   
 $R = +3.8661864E-01$  SIGNIFICANCE OF R = SIGNIFICANT  $S_e = +7.2687044E-02$   
 $t = +9.8998789E+00$  SIGNIFICANCE OF t = SIGNIFICANT  $S_c = +6.2606808E+01$   
 $N = 559$  DEGREES OF FREEDOM = 557  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 77 DEG F, AMB RH



ANB 3066 PROPELLANT (AMB 17 TENSILE MAX STRESS, 1750 IN/MIN, 800 PSI UNLND CTNS)

Figure 5-46

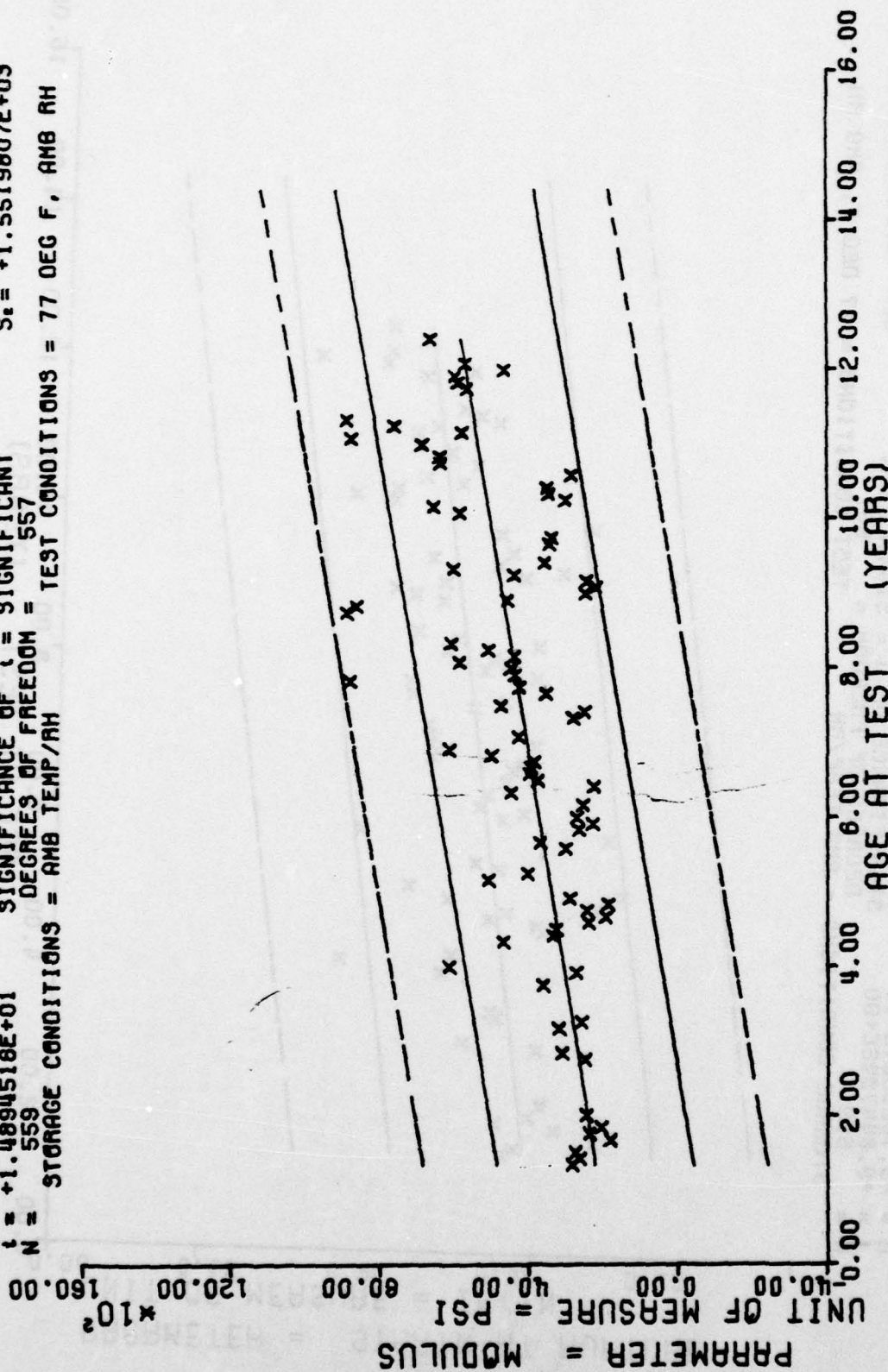
$Y = ((+3.4148223E-01) + (-4.5741799E-04) \times X)$   
 $F = +9.3021871E+01$  SIGNIFICANCE OF F = SIGNIFICANT  $G_1 = +4.4089192E-02$   
 $R = -3.7829921E-01$  SIGNIFICANCE OF R = SIGNIFICANT  $S_1 = +4.7426459E-05$   
 $t = +9.6447846E+00$  SIGNIFICANCE OF t = SIGNIFICANT  $S_2 = +4.0849359E-02$   
 $N = 559$  DEGREES OF FREEDOM = 557  
 STORAGE CONDITIONS = AMB TEMP/AM TEST CONDITIONS = 77 DEG F, AMB RH



AMB 3066 PROPELLANT (AMB, P) TENSILE STN • RUPT, 1750 IN/MIN, 600 PSI, UNLND CT

Figure 5-47

$Y = ((+1.7999412E+03) + (+2.6837879E+01) * X)$   
 $F = +2.2184682E+02$  SIGNIFICANCE OF F = SIGNIFICANT  $G_1 = +1.8335603E+03$   
 $R = +5.9370397E-01$  SIGNIFICANCE OF R = SIGNIFICANT  $S_1 = +1.8018631E+00$   
 $t = +1.4894518E+01$  SIGNIFICANCE OF t = SIGNIFICANT  $S_2 = +1.5519807E+03$   
 $N = 559$  DEGREES OF FREEDOM = 557  
 STORAGE CONDITIONS = AMB TEMP/AH TEST CONDITIONS = 77 DEG F, AMB RH



AMB 3066 PROPELLANT (AMB, P) TENSILE MODULUS, 1750 IN/MIN, 600 PSI, UNLND CTNS

Figure 5-48



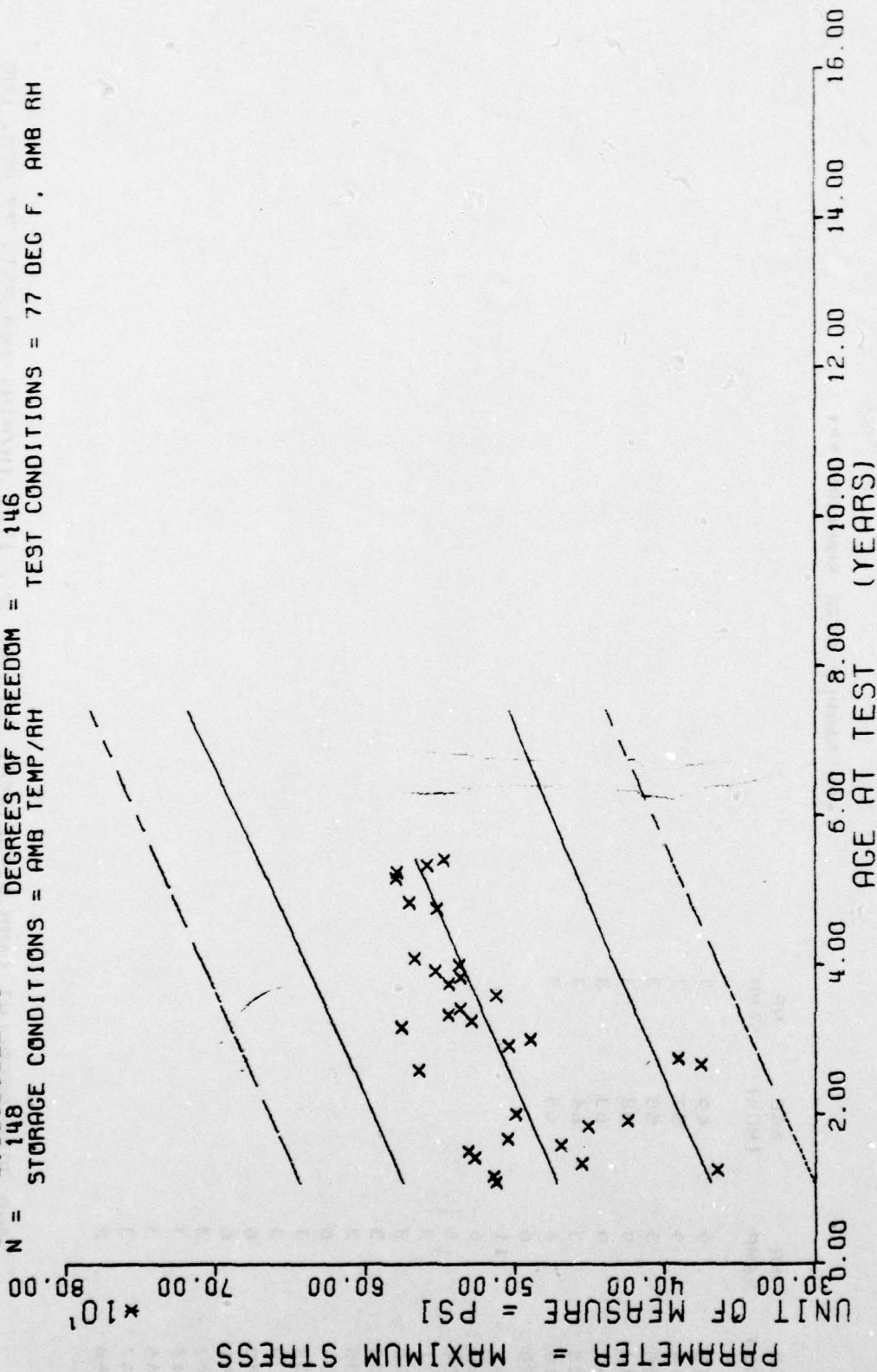
\*\*\* SAMPLE SIZE SUMMARY \*\*\*

AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP
13	9	49	3
14	9	57	3
15	3	58	3
16	9	62	3
17	9	63	3
18	3	64	3
19	6	65	3
20	6		
22	11		
23	6		
24	6		
31	3		
32	3		
33	3		
35	3		
36	6		
38	3		
39	3		
40	6		
41	6		
43	3		
45	3		
46	3		
47	3		
48	2		

ANR 1066 PROPLANT (ANR P POLYMER) TENSILE SN, 1750 IN/MIN, 600 PSI, 77 DEG, LHD

This sample size summary is applicable to figures 5-49, 5-50 and 5-51

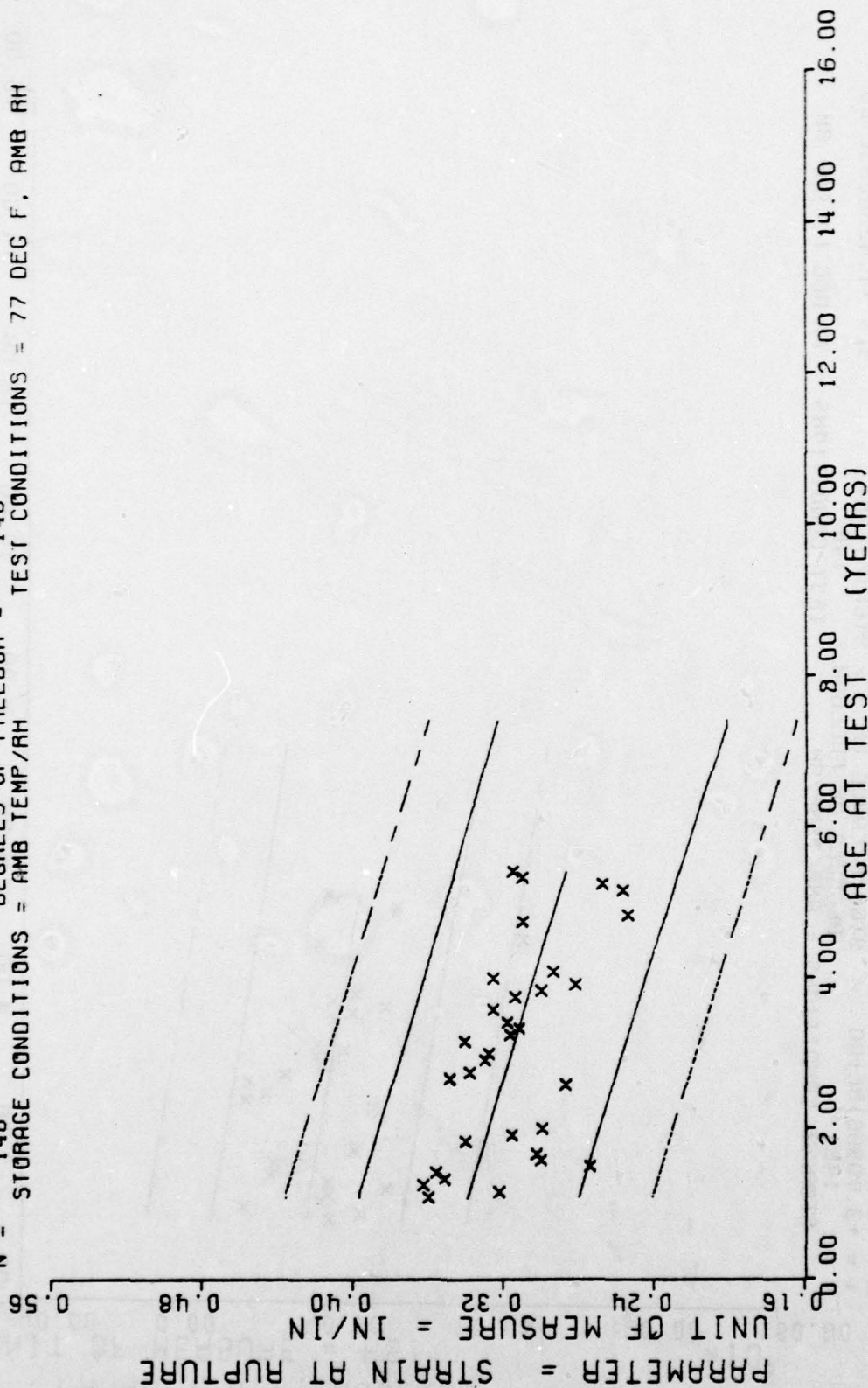
$Y = (( +4.4813353E+02 ) + ( +1.8248692E+00 ) * X)$   
 $F = +3.6673916E+01$  SIGNIFICANCE OF F = SIGNIFICANT  $G_1 = +6.3992695E+01$   
 $R = +4.4806433E-01$  SIGNIFICANCE OF R = SIGNIFICANT  $S_1 = +3.0133745E-01$   
 $t = +6.0558992E+00$  SIGNIFICANCE OF t = SIGNIFICANT  $S_2 = +5.7405142E+01$   
 $N = 148$  DEGREES OF FREEDOM = 146  
 STORAGE CONDITIONS = AMB TEMP/AM TEST CONDITIONS = 77 DEG F, AMB RH



ANB 3066 PROPLANT (ANB P POLYMER) TENSILE SM, 1750 IN/MIN, 600 PSI, 77 DEG, LND

Figure 5-49

$Y = ((+3.5214374E-01) + (-1.0132527E-03) \times X)$   
 $F = +3.5428878E+01$  SIGNIFICANCE OF F = SIGNIFICANT  
 $R = -4.4190152E-01$  SIGNIFICANCE OF R = SIGNIFICANT  
 $t = +5.9522163E+00$  SIGNIFICANCE OF t = SIGNIFICANT  
 $N = 148$  DEGREES OF FREEDOM = 146  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 77 DEG F, AMB RH

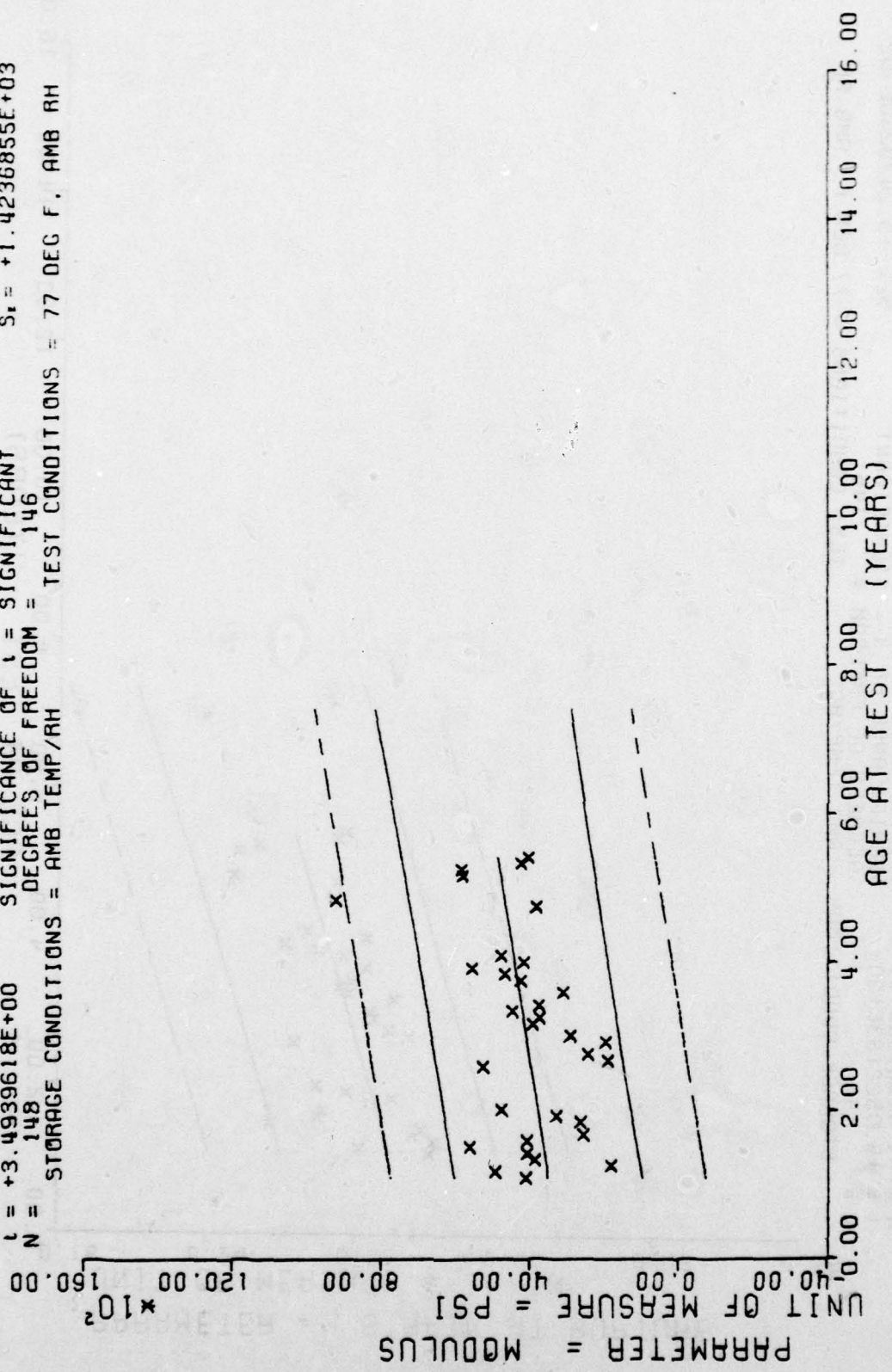


AMB 3066 PROPLNT (AMB P POLYMER) TENSILE ER, 1750 IN/MIN, 600 PSI, 77 DEG, LND

Figure 5-50



$F = +1.2207769E+01$  SIGNIFICANCE OF F = SIGNIFICANT  $G_1 = +1.4769619E+03$   
 $R = +2.7778209E-01$  SIGNIFICANCE OF R = SIGNIFICANT  $S_1 = +7.4733684E+00$   
 $t = +3.4939618E+00$  SIGNIFICANCE OF t = SIGNIFICANT  $S_2 = +1.4236855E+03$   
 $N = 148$  DEGREES OF FREEDOM = 146  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 77 DEG F, AMB RH



ANB 3066 PROPLANT (ANB P POLYMER) TENSILE MOD 1750 IN/MIN 77 DEG 600 PSI LINED

Figure 5-51

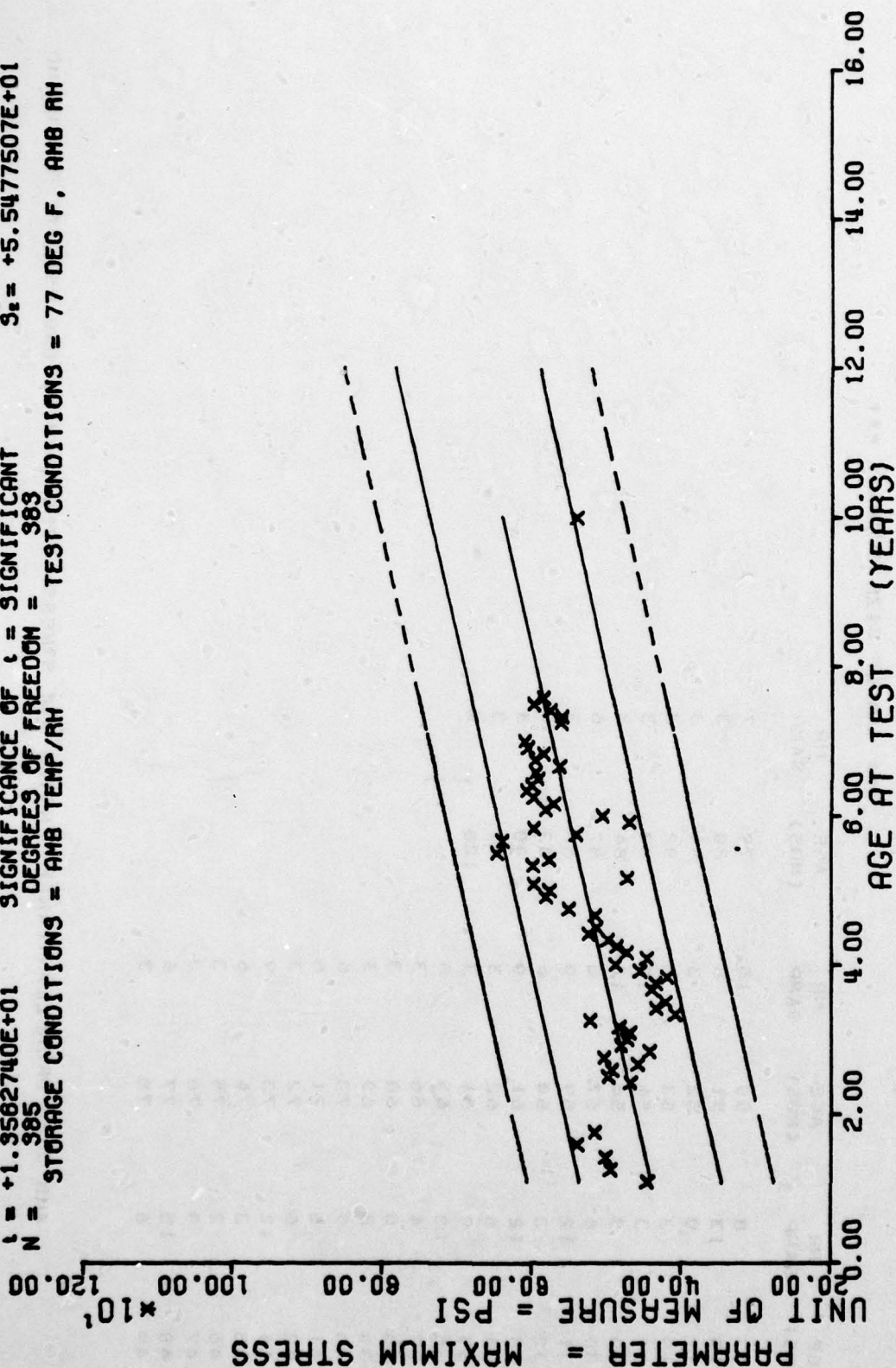
\*\*\* SAMPLE SIZE SUMMARY \*\*\*

AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP
13	8	50	15	79	7
15	13	51	6	80	3
17	9	52	3	81	3
19	3	53	6	82	3
21	3	54	18	83	3
29	3	56	12	84	3
30	6	57	6	87	6
31	12	59	9	88	3
32	3	60	6	89	3
33	12	61	9	90	3
34	6	62	3	91	3
35	9	64	3	120	3
36	18	65	6		
37	4	66	3		
38	6	68	3		
39	3	69	3		
40	9	70	6		
41	6	71	6		
42	6	72	3		
44	12	73	9		
45	3	74	6		
46	2	75	3		
47	9	76	3		
48	15	77	6		
49	6	78	3		

ANR 3066 PROPFLANT(ANT) TENSILE MAX STRESS. 1750 IN/MIN. 600 PSI. 77 DEG IN/IN

This sample size summary is applicable to figures 5-52, 5-53 and 5-54

$Y = ((+4.1722492E+02) + (+1.8681529E+00) * X)$   
 $F = +1.8394793E+02$  SIGNIFICANCE OF F = SIGNIFICANT  $G = +6.7409780E+01$   
 $R = +5.6960772E-01$  SIGNIFICANCE OF R = SIGNIFICANT  $S_1 = +1.9774154E-01$   
 $L = +1.3582740E+01$  SIGNIFICANCE OF L = SIGNIFICANT  $S_2 = +5.5477507E+01$   
 $N = 385$  DEGREES OF FREEDOM = 383  
 STORAGE CONDITIONS = AMB TEMP/AM TEST CONDITIONS = 77 DEG F, AMB RH

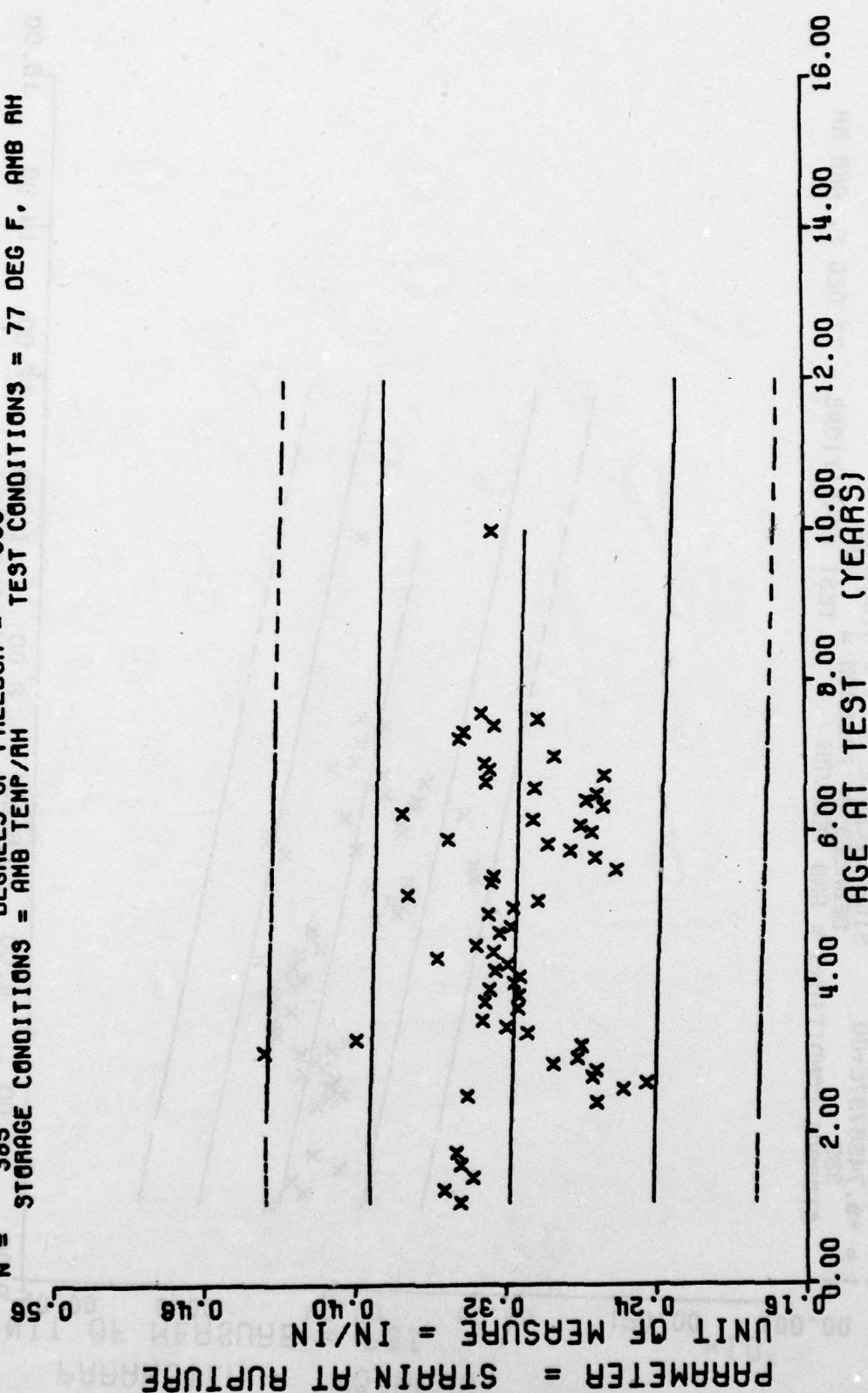


AMB 3066 PROPELLANT (ANT) TENSILE MAX STRESS, 1750 IN/MIN, 600 PSI, 77 DEG UNLND

Figure 5-52



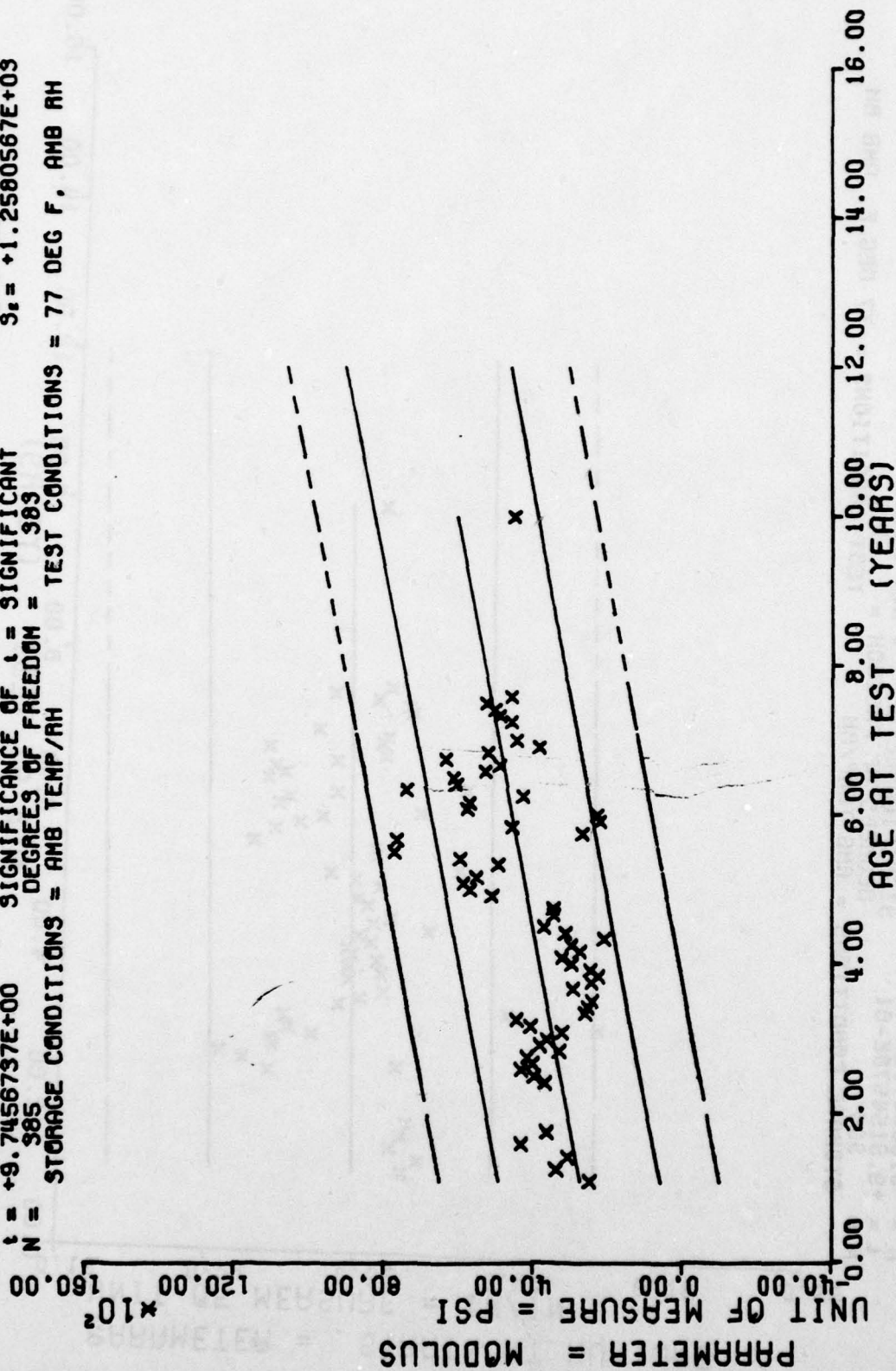
$Y = ((+3.1912746E-01) + (-1.0670682E-04) * X)$   
 $F = +9.8916304E-01$  SIGNIFICANCE OF F = NOT SIGNIFICANT  $G_v = +4.3343292E-02$   
 $R = -5.0600718E-02$  SIGNIFICANCE OF R = NOT SIGNIFICANT  $S_e = +1.0761664E-04$   
 $t = +9.9154578E-01$  SIGNIFICANCE OF t = NOT SIGNIFICANT  $S_e = +4.3344242E-02$   
 $N = 385$  DEGREES OF FREEDOM = 383  
 STORAGE CONDITIONS = AMB TEMP/AH TEST CONDITIONS = 77 DEG F, AMB RH



ANB 3066 PROPELLANT (ANT) TENSILE STN AT RUP, 1750 IN/MIN, 600 PSI, 77 DEG UNLND

Figure 5-53

$Y = ((+2.3753268E+03) + (+9.0441085E+01) \times X)$   
 $F = +9.4978157E+01$  SIGNIFICANCE OF F = SIGNIFICANT  $\sigma_2 = +1.4035847E+03$   
 $R = +4.4576892E-01$  SIGNIFICANCE OF R = SIGNIFICANT  $S_2 = +3.1235485E+00$   
 $t = +9.7456737E+00$  SIGNIFICANCE OF t = SIGNIFICANT  $S_2 = +1.2580567E+03$   
 $N = 385$  DEGREES OF FREEDOM = 383  
 STORAGE CONDITIONS = AMB TEMP/AH TEST CONDITIONS = 77 DEG F, AMB RH



AMB 3068 PROPELLANT (ANT) TENSILE MODULUS, 1750 IN/MIN, 600 PSI, 77 DEG UNLND

Figure 5-54

\*\*\* SAMPLE SIZE SUMMARY \*\*\*

AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP
13	3	42	3
15	3	43	3
16	3	44	6
17	3	45	6
18	3	46	3
19	3	48	3
21	6	50	3
22	3	51	6
24	6	52	6
25	3	53	6
26	3	54	3
27	8	55	3
28	3	58	3
29	3	60	3
30	5	61	3
31	3	62	6
32	3	63	3
33	3	65	3
34	9	69	3
35	3	69	3
36	6	72	3
38	3	77	3
39	3	80	3
40	3		
41	6		

ANR 3066 PROPLNT (ANT P POLYMER) TENSILE SM, 1750 IN/MIN 600 PSI 77 DEG LINED

This sample size summary is applicable to flugres 5-55, 5-56 and 5-57



$Y = ((+4.4116418E+02) + (+1.8800207E+00) * X)$   
 $F = +5.3824650E+01$  SIGNIFICANCE OF F = SIGNIFICANT  $G = +6.7875085E+01$   
 $R = +4.6888143E-01$  SIGNIFICANCE OF R = SIGNIFICANT  $S_e = +2.5625481E-01$   
 $l = +7.3365285E+00$  SIGNIFICANCE OF l = SIGNIFICANT  $S_e = +6.0108160E+01$   
 $N = 193$  DEGREES OF FREEDOM = 191  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 77 DEG F, AMB RH

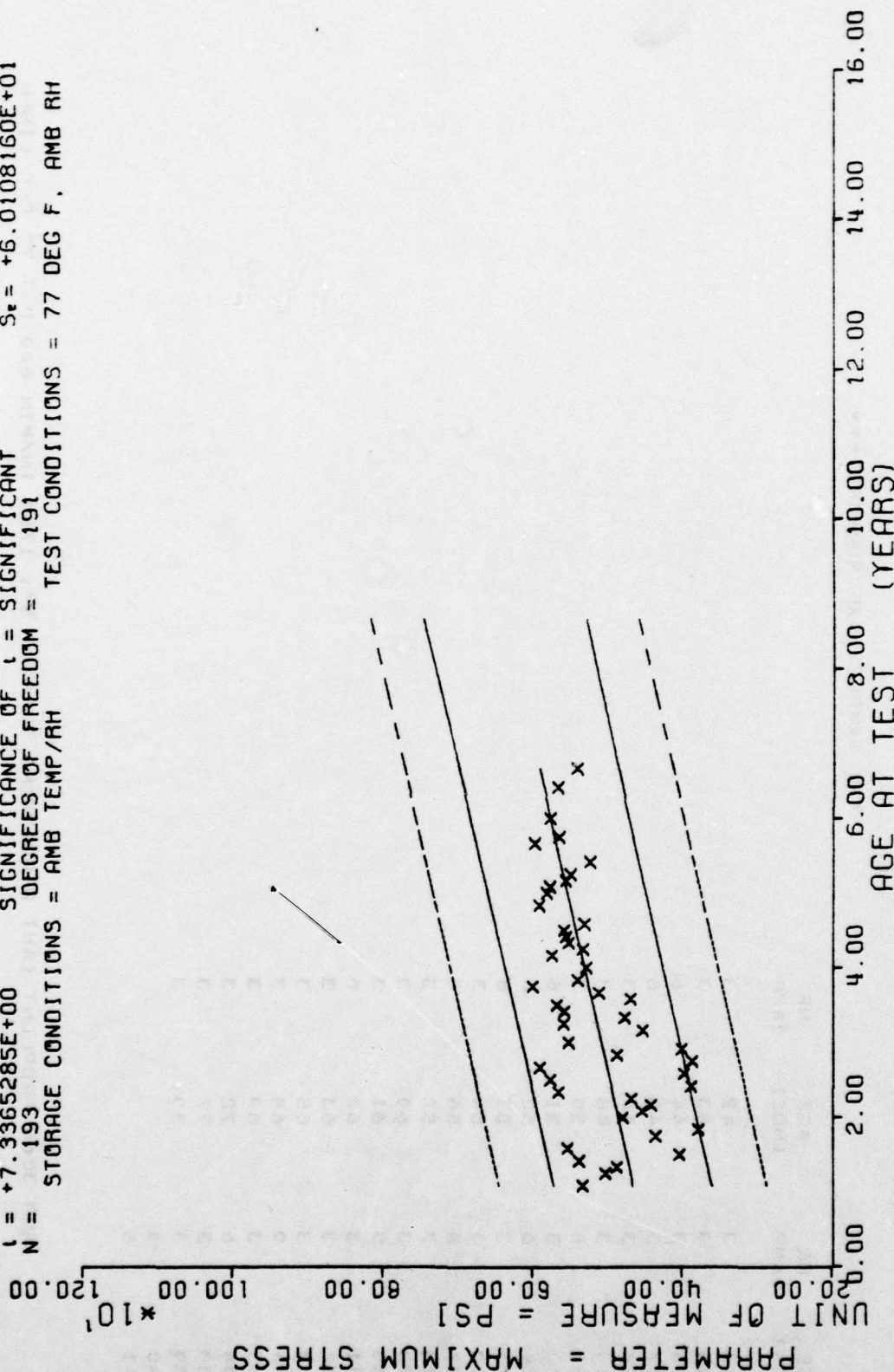
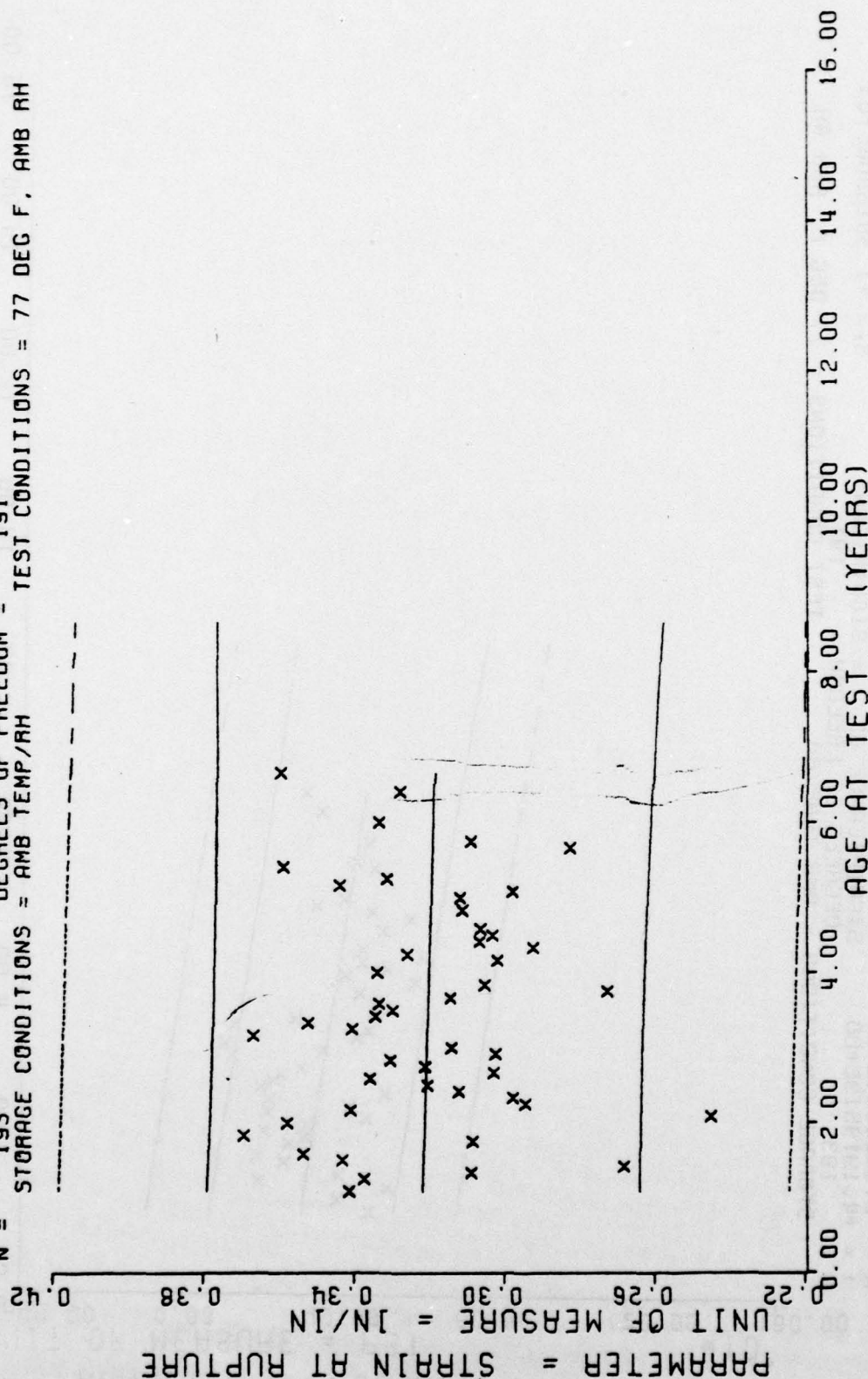


Figure 5-55

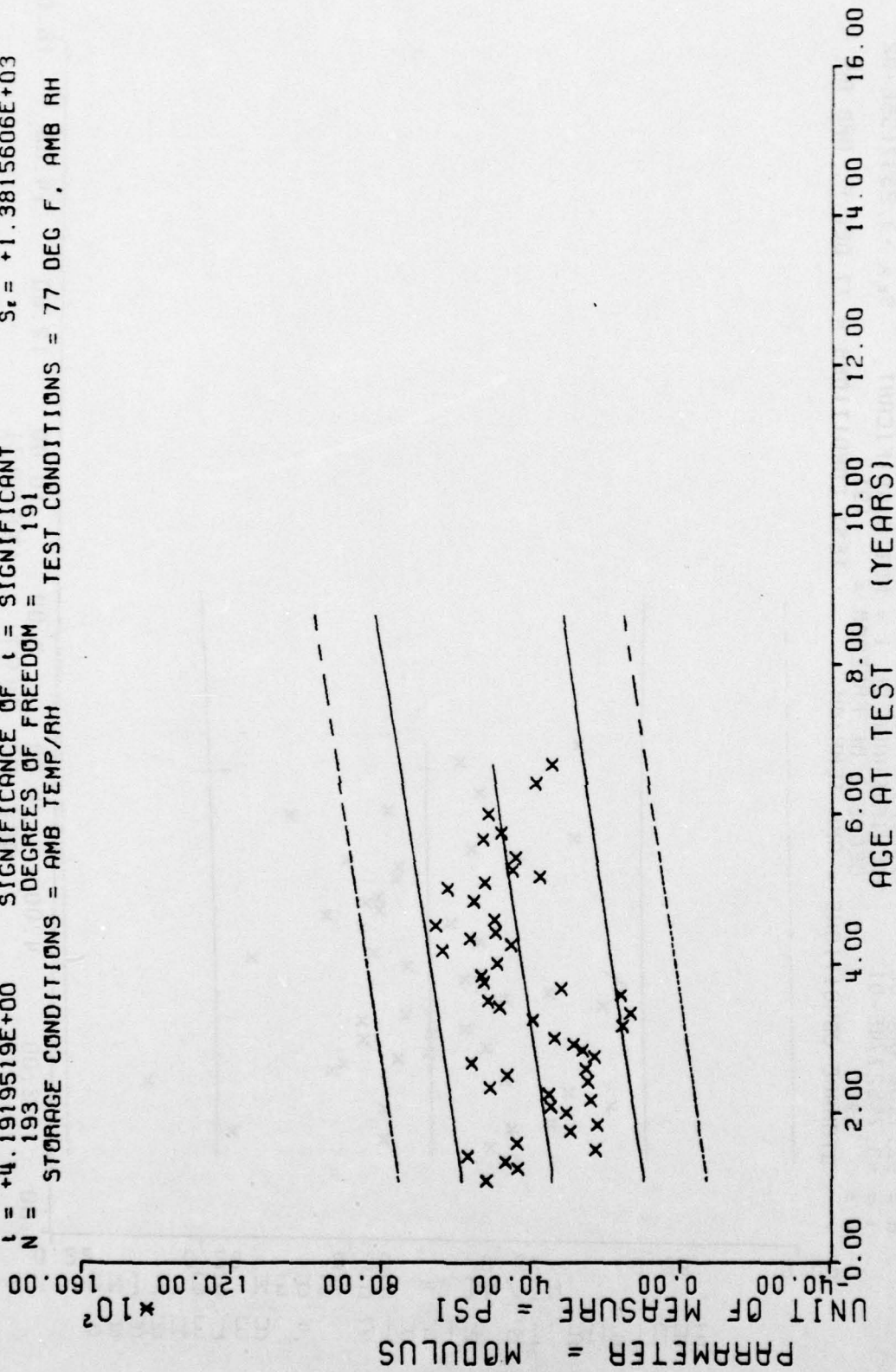
$Y = ((+3.2245157E-01) + (-5.1770510E-05) * X)$   
 $F = +1.4102108E-01$  SIGNIFICANCE OF F = NOT SIGNIFICANT  $\sigma_y = +3.2264738E-02$   
 $R = -2.7162208E-02$  SIGNIFICANCE OF R = NOT SIGNIFICANT  $S_e = +1.3786067E-04$   
 $t = +3.7552774E-01$  SIGNIFICANCE OF t = NOT SIGNIFICANT  $S_e = +3.2337155E-02$   
 $N = 193$  DEGREES OF FREEDOM = 191  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 77 DEG F, AMB RH



AMB 3066 PROPLINT (ANT P POLYMER) TENSILE ER, 1750 IN/MIN 600 PSI 77 DEG LINED

Figure 5-56

$Y = ((+3.1031056E+03) + (+2.4690214E+01) \times X)$   
 $F = +1.7572461E+01$  SIGNIFICANCE OF F = SIGNIFICANT  $G_1 = +1.4399513E+03$   
 $R = +2.9026041E-01$  SIGNIFICANCE OF R = SIGNIFICANT  $S_1 = +5.8899087E+00$   
 $t = +4.1919519E+00$  SIGNIFICANCE OF t = SIGNIFICANT  $S_2 = +1.3815606E+03$   
 $N = 193$  DEGREES OF FREEDOM = 191  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 77 DEG F, AMB RH





## SECTION VI

### STRESS RELAXATION AND STRAIN DILATATION

#### A. STRESS RELAXATION:

An end bonded 1/2" x 1/2" x 4" specimen (1.27 x 1.27 x 10.16 cm) is tested on the stress relaxometer. Load is applied at 2 in/min (.085 cm/sec). Timing begins when the load is applied. Specimens have been strained at both 1% and 3%.

The use of 1% strain over the range of temperatures was not introduced into the program until Phase 3 of Minuteman III testing and Phase B Series 2 for Minuteman II. In this report, data for both 1% and 3% at 77°F are shown for a comparison between applied strains. As a result of a change in the program, Aerojet is now using 2% strain. Thiokol has shown that strains introduced into the propellant during machining remain in the samples and a higher strain is required to give reproducible and accurate relaxation moduli. The 1% strain is considered to be very marginal insofar as reproducible data is concerned.

Table 6-1 gives the significance of 't' for both 1% and 3% strains. The number of specimens represented in each regression is shown so that the preponderance of test data at 3% strain is obvious.

ANA "G" is not significant at 1% strain (95 mo), but shows a significant decrease at 3% (107 mo).

Unlined cartons of ANB "G" show a significant decrease for both 1% and 3% (154 mo) while there is no significant change for lined cartons (55 mo).

Unlined cartons of ANB "P" show a significant increase up to 147 months. There is no significant change in lined cartons at 1% (65 mo), but the 1000 second modulus at 3% shows a significant increase.

Unlined cartons of ANT "P" do not show a significant decrease at 1% (81 mo), but the decrease is significant at 3% (91 mo). Lined cartons (80 mo) still show a significant increase.

These data tend to contradict ASPC's findings which suggests that samples prepared from cartons appeared to decrease in modulus after 3.5 to 4 years of storage (ASPC 0162-06SAAS-21).

Gradient stress relaxation does not show a change from the last report. Minima occurs at approximately 2.2 inches from the liner.

#### B. STRAIN DILATATION:

The same type of specimen is used for this test as for stress relaxation. Testing is done in a gas dilatometer at 77°F (25°C) without pressure.

Poisson's Ratio at 15% strain and dilatation at maximum strain consistently show a significant decrease (Table 6-2). Only Poisson's ratio at maximum strain does not show consistent significant decrease which does occur for ANB "P" unlined and ANT "P" lined. No parameter is significant for ANA "G" unlined cartons.

TABLE 6-1  
STRESS RELAXATION

Significance of Regression Slopes

SYSTEM	10 sec				1000 sec	
	N	1%	N	3%	1%	3%
ANA G Unlined	54	NS	178	Sig dec	NS	Sig dec
ANB G Unlined	144	Sig dec	634	Sig dec	Sig dec	Sig dec
ANB G Lined	136	NS	88	NS	NS	Sig dec
ANB P Unlined	129	Sig inc	517	Sig inc	Sig inc	Sig inc
ANB P Lined	48	NS	110	NS	NS	Sig inc
ANT P Unlined	125	NS	357	Sig dec	Sig dec	Sig dec
ANT P Lined	93	Sig inc	237	Sig inc	Sig inc	Sig inc
ANA & ANB G Unlined	198	Sig dec			Sig dec	
ANB G & P Unlined	273	NS			NS	
ANB G & P Lined	84	NS			NS	
ANB & ANT Unlined	255	Sig inc			Sig inc	
ANB & ANT Lined	141	Sig inc			Sig inc	

TABLE 6-2  
DILATATION

Significance of Regression Slopes

SYSTEM	POISSONS RATIO AT 15% STRAIN	POISSONS RATIO AT MAX STRAIN	DILATATION AT MAX STRAIN
ANA G Unlined	NS	NS	NS
ANB G Unlined	Sig Dec	NS	Sig Dec
ANB G Lined	Sig Dec	NS	Sig Dec
ANB P Unlined	Sig Dec	Sig Dec	Sig Dec
ANB P Lined	Sig Dec	NS	Sig Dec
ANT P Unlined	Sig Dec	NS	Sig Dec
ANT P Lined	Sig Dec	Sig Dec	Sig Dec

NS = Not significantly different from zero slope

Sig inc = Positive slope

Sig dec = Negative slope



\*\*\* LINEAR REGRESSION ANALYSIS \*\*\*

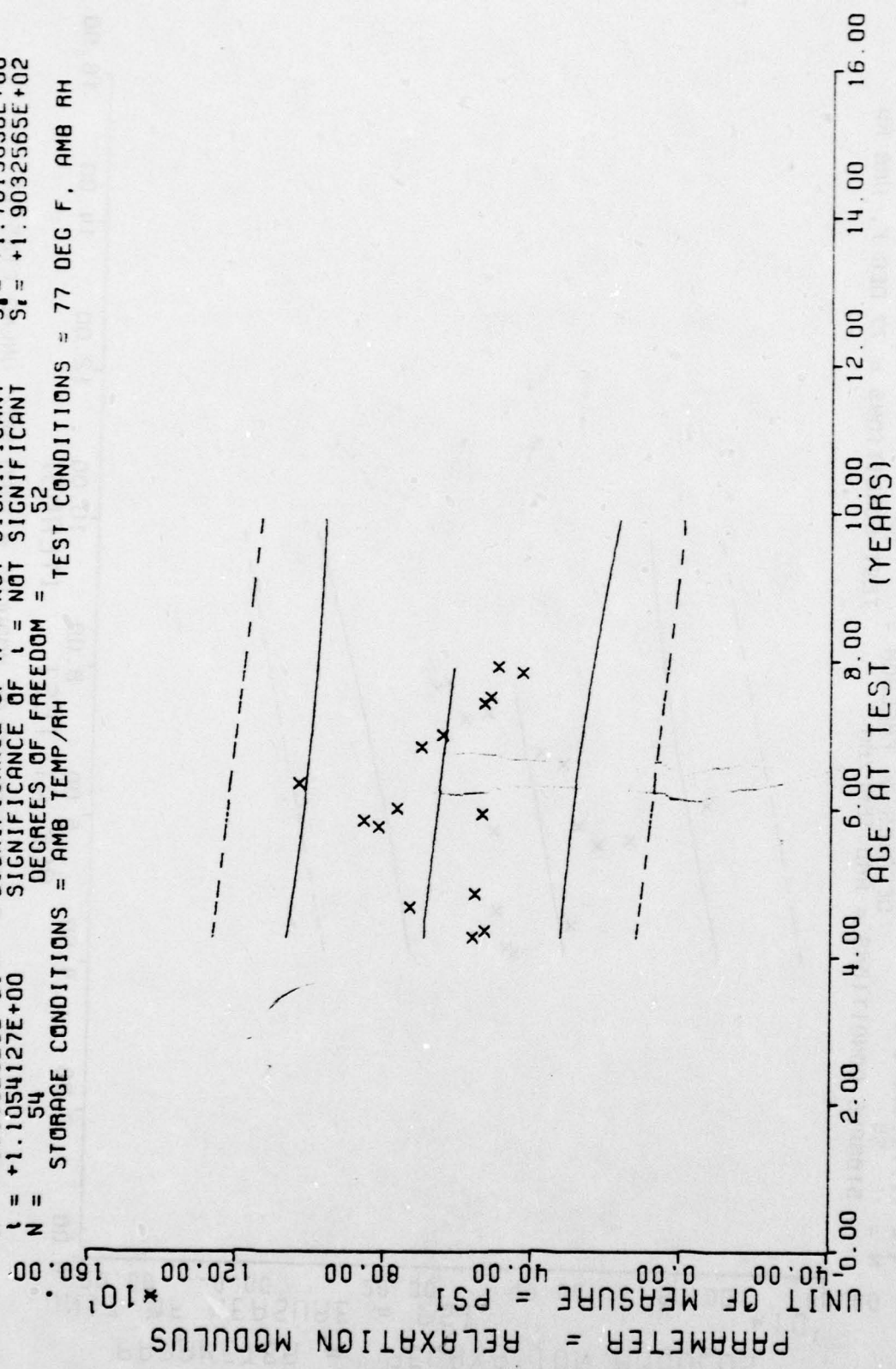
\*\*\* ANALYSIS OF TIME SERIES \*\*\*

AGE (MONTHS)	SPECIMENS PER GROUP	MEAN Y	STANDARD DEVIATION	MAXIMUM Y	MINIMUM Y	REGRESSION Y
51.0	6	+5.6333325E+02	+9.2448183E+01	+6.8000000E+02	+4.5000000E+02	+6.5562231E+02
52.0	3	+5.3000000E+02	+4.5559995E+01	+5.8000000E+02	+4.8000000E+02	+6.9367529E+02
55.0	6	+7.3166650E+02	+2.3945076E+02	+1.0400000E+03	+4.7000000E+02	+6.8588745E+02
59.0	3	+5.5666650E+02	+5.7735026E+00	+5.6000000E+02	+5.5000000E+02	+6.8199365E+02
63.0	6	+8.1666650E+02	+2.2617448E+02	+1.0400000E+03	+6.1000000E+02	+6.6057690E+02
70.0	3	+8.5666650E+02	+5.5075705E+01	+9.2000000E+02	+8.2000000E+02	+6.5862988E+02
71.0	3	+5.3666650E+02	+1.1547005E+01	+5.5000000E+02	+5.3000000E+02	+6.5668286E+02
72.0	3	+7.6666650E+02	+3.0550504E+01	+8.0000000E+02	+7.4000000E+02	+6.5473608E+02
76.0	3	+1.0300000E+03	+7.2111025E+01	+1.0500000E+03	+9.5000000E+02	+6.4654759E+02
82.0	3	+7.0000000E+02	+1.7320508E+01	+7.1000000E+02	+6.8000000E+02	+6.3526635E+02
84.0	3	+6.4333325E+02	+5.8554652E+01	+7.1000000E+02	+6.0000000E+02	+6.3137231E+02
89.0	3	+5.3000000E+02	+4.5925756E+01	+5.8000000E+02	+4.9000000E+02	+6.2163745E+02
90.0	3	+5.1333325E+02	+2.3094010E+01	+5.4000000E+02	+5.0000000E+02	+6.1969042E+02
94.0	3	+4.2666650E+02	+8.5049005E+01	+4.9000000E+02	+3.3000000E+02	+6.1190258E+02
95.0	3	+4.9333325E+02	+1.5275252E+01	+5.1000000E+02	+4.8000000E+02	+6.0955556E+02

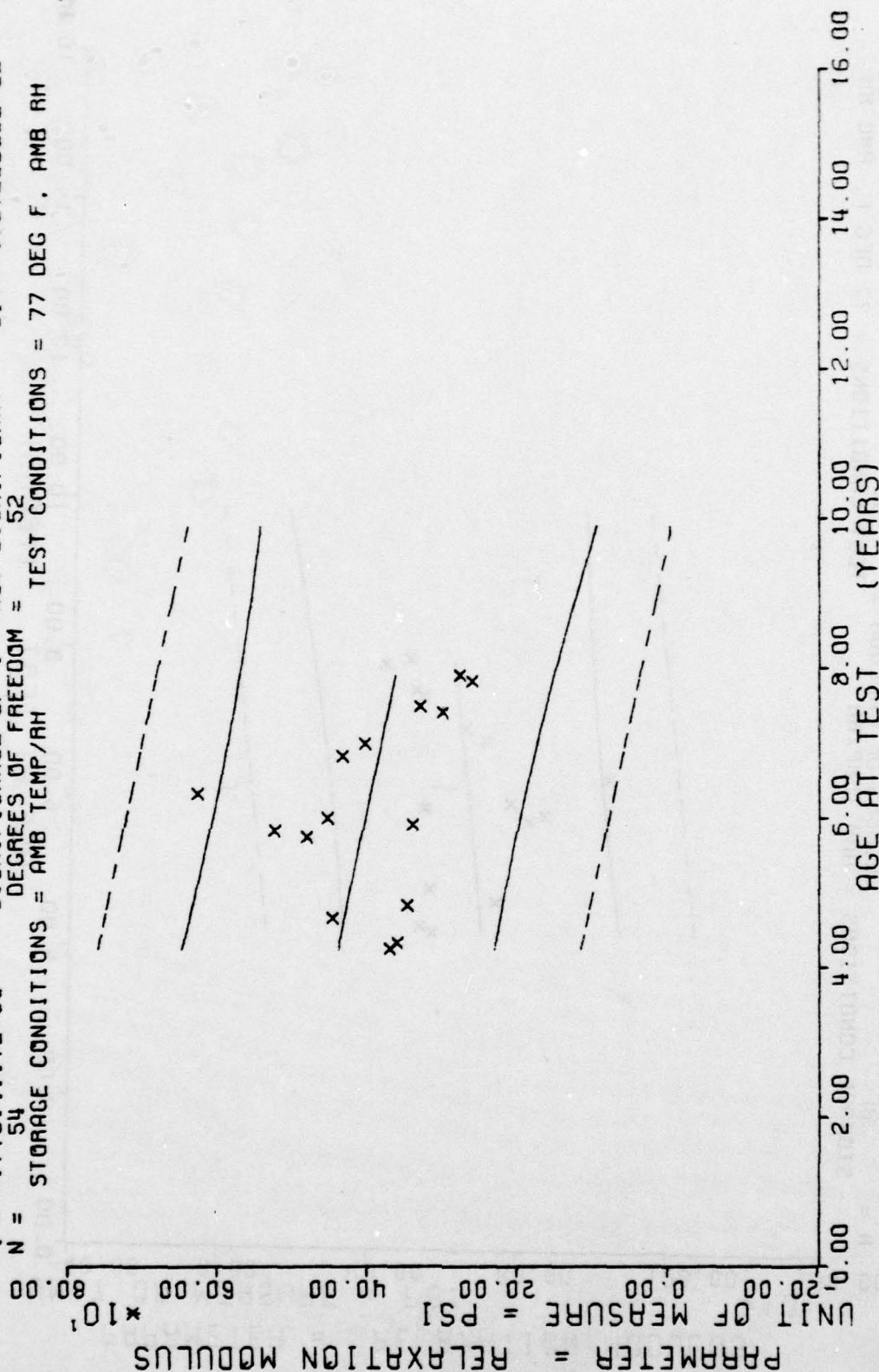
ANR 3066 PROPELLANT (ANA. G POLYMER) RELAX MODULUS @ 10 SEC. UNLND CTNS. 1X STA

This sample size summary applies to figures 6-1 and 6-2

$Y = ((+7.9491795E+02) + (-1.9469700E+00) \times X)$   
 $F = +1.2219373E+00$  SIGNIFICANCE OF F = NOT SIGNIFICANT  $\sigma_1 = +1.9072373E+02$   
 $R = -1.5152320E-01$  SIGNIFICANCE OF R = NOT SIGNIFICANT  $S_0 = +1.7613058E+00$   
 $t = +1.1054127E+00$  SIGNIFICANCE OF t = NOT SIGNIFICANT  $S_1 = +1.9032565E+02$   
 $N = 54$  DEGREES OF FREEDOM = 52  
 STORAGE CONDITIONS = AMB TEMP/AH TEST CONDITIONS = 77 DEG F, AMB RH



$Y = ((+5.2954059E+02) + (-1.7782598E+00) * X)$   
 SIGNIFICANCE OF F = NOT SIGNIFICANT  $G = +1.0947878E+02$   
 SIGNIFICANCE OF R = NOT SIGNIFICANT  $S_0 = +9.9265837E-01$   
 SIGNIFICANCE OF t = NOT SIGNIFICANT  $S_1 = +1.0726606E+02$   
 DEGREES OF FREEDOM = 52  
 STORAGE CONDITIONS = AMB TEMP/AM TEST CONDITIONS = 77 DEG F, AMB RH





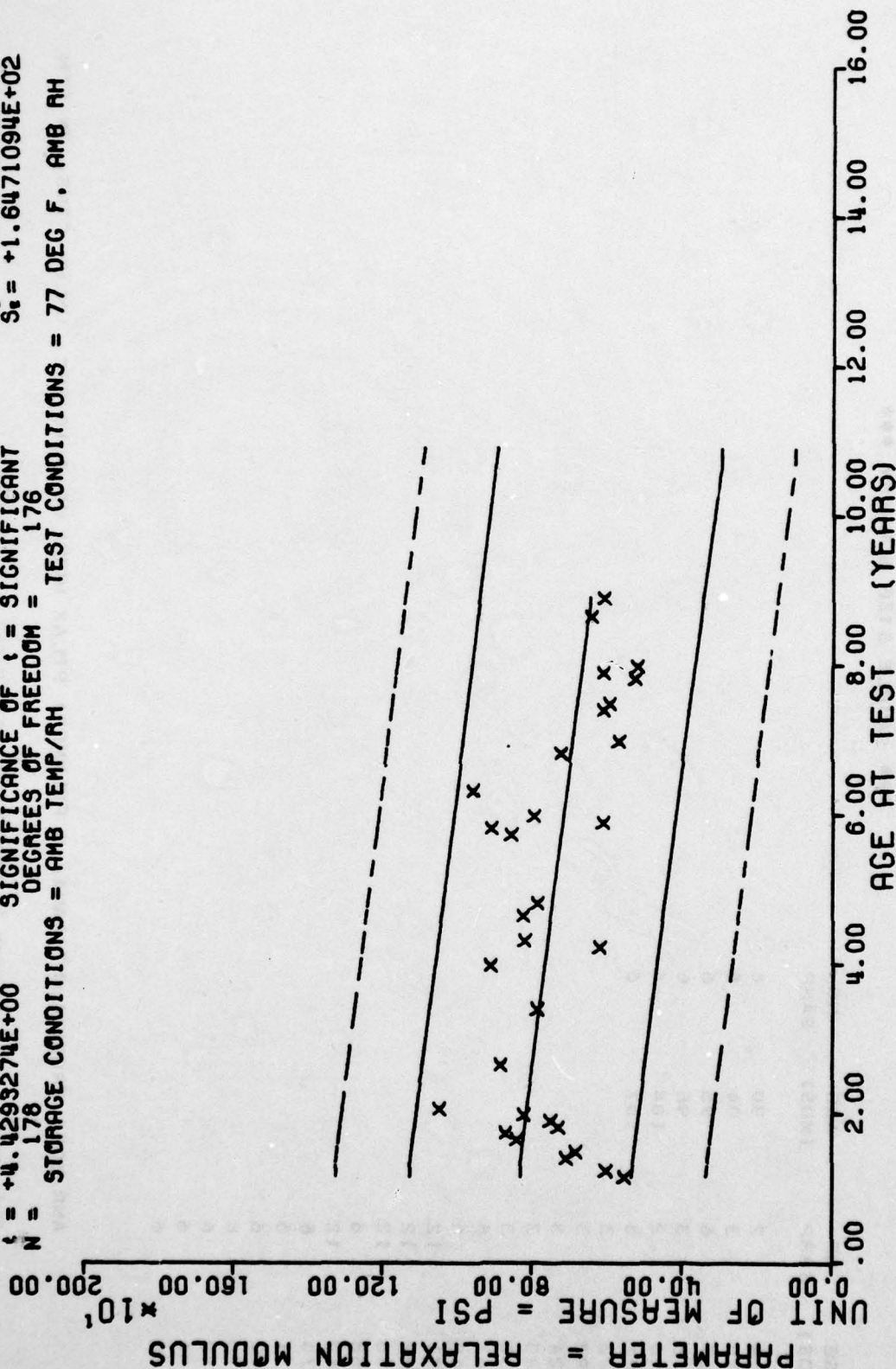
\*\*\* SAMPLE SIZE SUMMARY \*\*\*

AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP
14	2	90	6
15	3	94	6
17	6	95	6
18	3	96	6
20	2	104	6
21	3	107	6
22	3		
23	3		
24	3		
25	3		
32	3		
41	6		
49	6		
51	12		
52	12		
56	12		
58	6		
69	12		
70	6		
71	6		
72	6		
76	6		
82	6		
84	6		
89	6		

ANR 3066 PROPELLANT (ANA, G POLYMER) RELAX MODULUS @ 10 SEC. UNLND CTNS. 3% STN

This sample size summary is applicable to figures 6-3 and 6-4

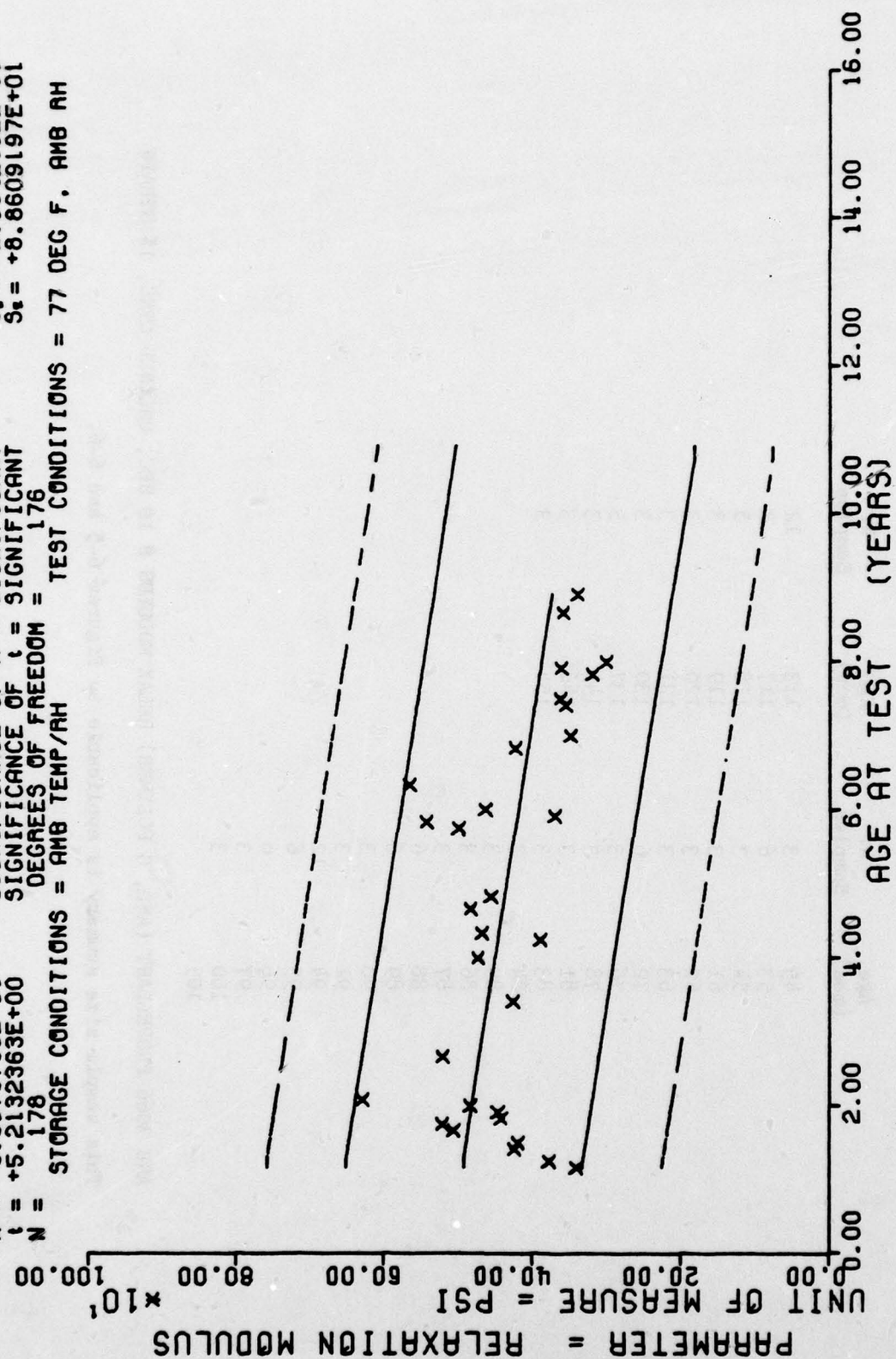
$Y = ((+8.6315829E+02) + (-2.0618311E+00) \times X)$   
 $F = +1.9618941E+01$  SIGNIFICANCE OF F = SIGNIFICANT  $\sigma_f = +1.7315749E+02$   
 $R = -3.1668652E-01$  SIGNIFICANCE OF R = SIGNIFICANT  $S_e = +4.6549531E-01$   
 $t = +4.4293274E+00$  SIGNIFICANCE OF t = SIGNIFICANT  $S_e = +1.6471094E+02$   
 $N = 178$  DEGREES OF FREEDOM = 176  
 STORAGE CONDITIONS = AMB TEMP/AH TEST CONDITIONS = 77 DEG F, AMB RH



ANB 3066 PROPELLANT (ANA, G POLYMER) RELAX MODULUS @ 10 SEC, UNLND CTNS, 3% STN

Figure 6-3

$Y = ((+5.1169419E+02) + (-1.3055065E+00) \times X)$   
 $F = +2.7177833E+01$  SIGNIFICANCE OF F = SIGNIFICANT  $\sigma_1 = +9.4935869E+01$   
 $R = -3.6573730E-01$  SIGNIFICANCE OF R = SIGNIFICANT  $S_1 = +2.5042152E-01$   
 $t = +5.2132363E+00$  SIGNIFICANCE OF t = SIGNIFICANT  $S_2 = +8.8609197E+01$   
 $N = 178$  DEGREES OF FREEDOM = 176  
 STORAGE CONDITIONS = AMB TEMP/AH TEST CONDITIONS = 77 DEG F, AMB RH



AMB 3066 PAPLLNT (ANA, G POLYMER) RELAX MODULUS • 1000 SEC, UNLND CTNS 3%

Figure 6-4



# SAMPLE SIZE SUMMARY

Age (mos)	Nr Samples	Age (mos)	Nr Samples
45	3	113	12
53	6	117	3
54	3	118	3
61	3	119	3
62	3	120	3
63	3	121	3
72	6	130	3
76	3	137	3
78	3	144	3
81	3	146	3
83	3	154	3
84	3		
85	3		
86	3		
87	3		
88	6		
89	6		
90	3		
91	3		
94	12		
95	6		
96	6		
97	3		
100	3		
105			

ANB 3066 PROPELLANT (AND, G POLYMER) RELAX MODULUS @ 10 SEC, UNLINED CTNS, 1% STRAIN

This sample size summary is applicable to Figures 6-5 and 6-6.

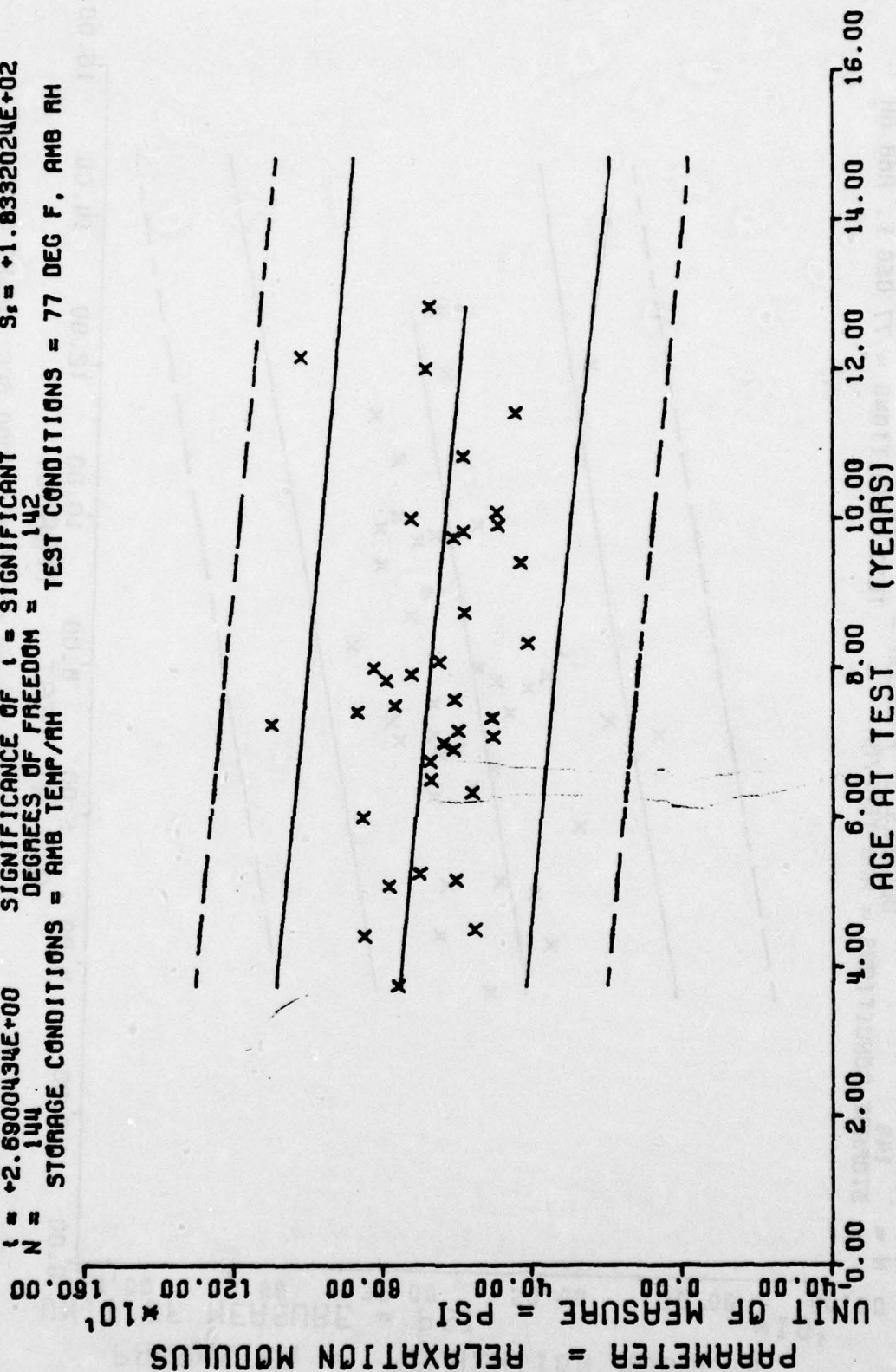
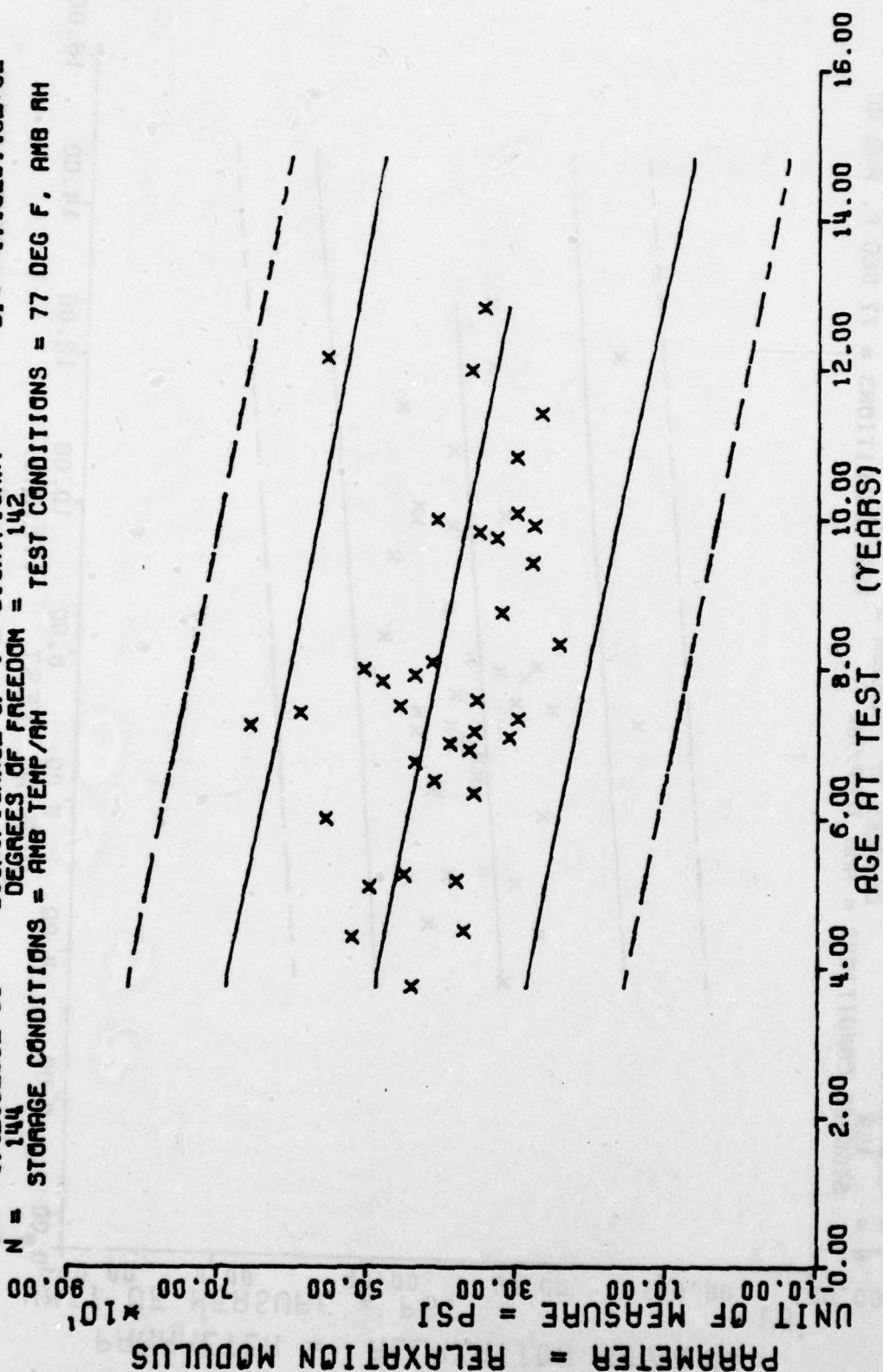
$$\begin{array}{l}
 F = +7.2363339E+00 \\
 R = -2.2020238E-01 \\
 N = +2.69000434E+00 \\
 Y = ((+8.2769708E+02) + (-1.6606845E+00) * X) \\
 \text{SIGNIFICANCE OF } F = \text{SIGNIFICANT} \\
 \text{SIGNIFICANCE OF } R = \text{SIGNIFICANT} \\
 \text{SIGNIFICANCE OF } t = \text{SIGNIFICANT} \\
 \text{DEGREES OF FREEDOM} = 142 \\
 \text{STORAGE CONDITIONS} = \text{AMB TEMP/AMB} \\
 \text{TEST CONDITIONS} = 77 \text{ DEG F, AMB RH}
 \end{array}$$


Figure 6-5

$F = +1.9549818E+01$   
 $R = -3.4787170E-01$   
 $t = +4.4215289E+00$   
 $N = 144$   
 $Y = ((+5.6250254E+02) + (-1.6417741E+00) * X)$   
 SIGNIFICANCE OF F = SIGNIFICANT  
 SIGNIFICANCE OF R = SIGNIFICANT  
 SIGNIFICANCE OF t = SIGNIFICANT  
 DEGREES OF FREEDOM = 142  
 STORAGE CONDITIONS = AMB TEMP/AMH TEST CONDITIONS = 77 DEG F, AMB RH



AMB 3066 PROPELLANT (AMB, G POLYMER) RELAX MODULUS @ 1000 SEC, UNLND CTNS, 1%

Figure 6-6



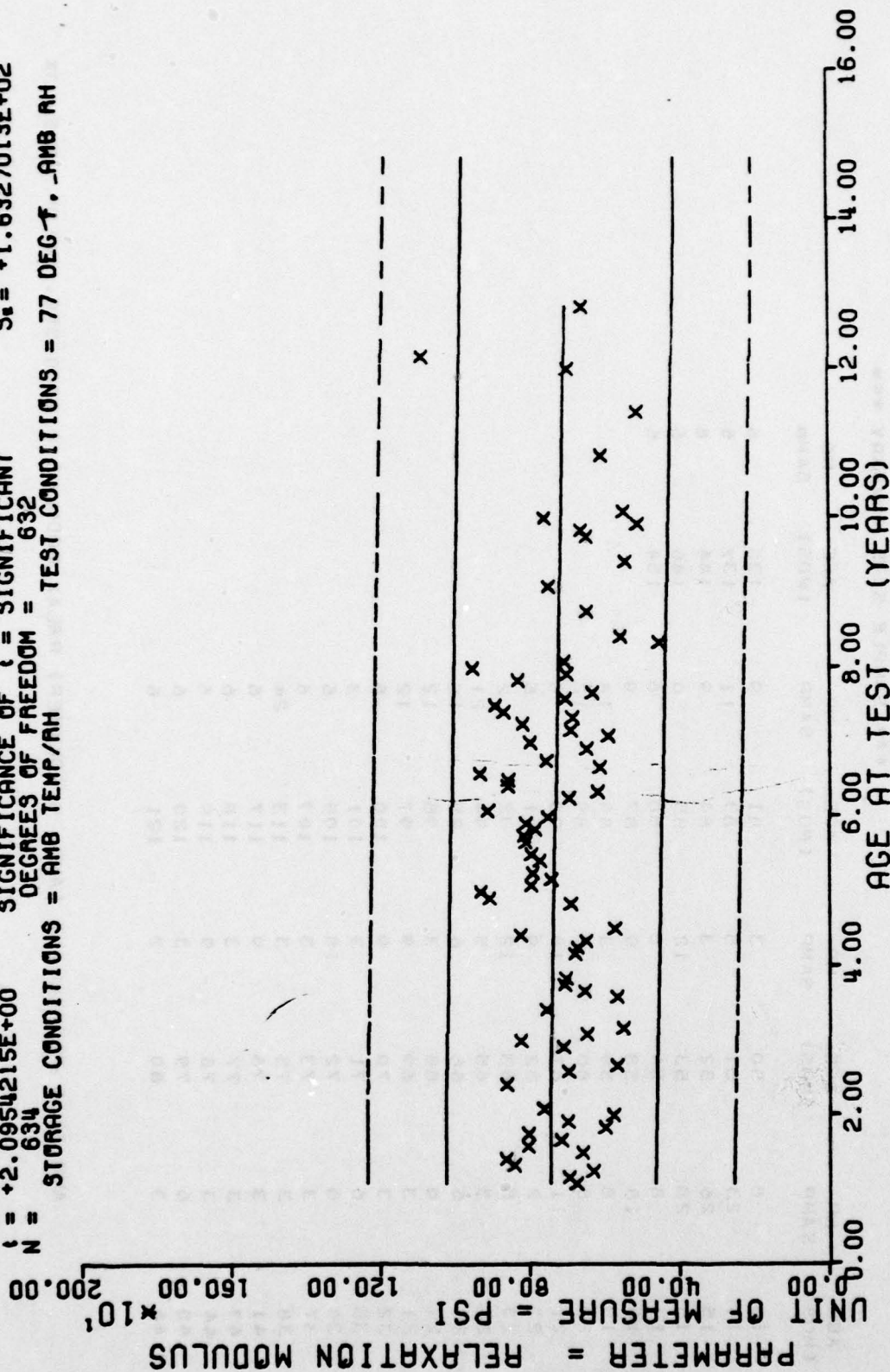
\*\*\* SAMPLE SIZE SUMMARY \*\*\*

AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP
13	8	50	3	81	9	130	6
14	23	51	5	83	11	137	6
15	26	52	3	84	9	144	6
16	28	53	12	85	6	146	6
17	8	54	6	86	6	154	6
18	18	58	9	87	9		
19	8	59	3	89	18		
20	8	60	3	89	12		
21	11	61	18	90	5		
22	2	62	9	91	6		
23	8	63	12	92	2		
24	3	65	5	94	21		
25	6	66	6	95	15		
29	9	68	3	96	12		
31	3	69	9	97	12		
32	3	70	9	100	6		
35	6	71	3	101	3		
36	5	72	18	105	6		
37	3	73	3	109	6		
38	3	75	3	113	24		
41	3	76	9	117	6		
43	3	77	3	118	6		
44	3	78	9	119	5		
45	6	79	3	120	6		
46	3	80	2	121	6		

ANR 3066 PROPELLANT (ANR, G POLYMER) RELAX MODULUS @ 1000 SEC. UNLMD CTNS. 3%

This sample size summary is applicable to figures 6-7 and 6-8

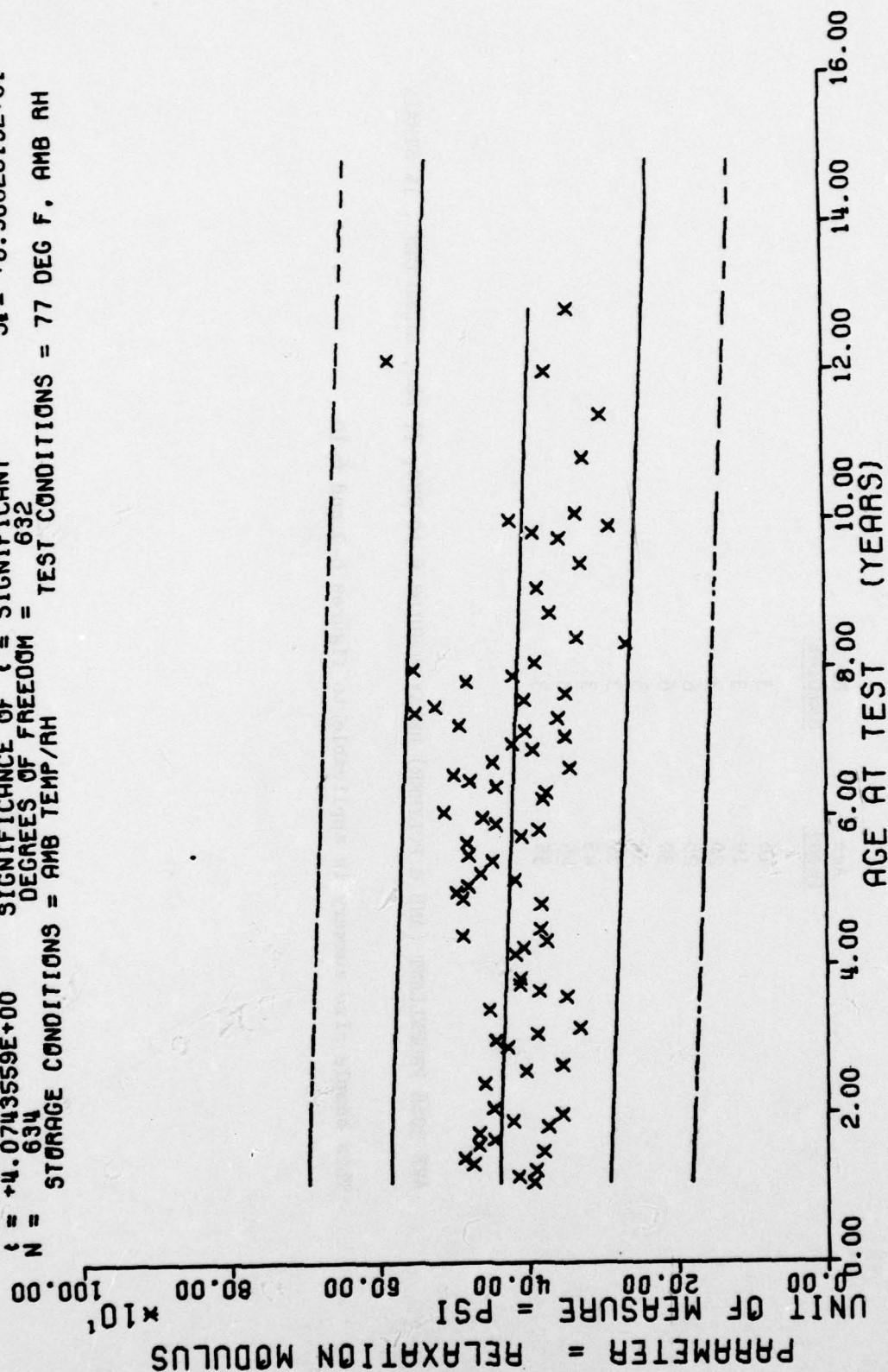
$Y = ((+7.5291197E+02) + (-3.6786813E-01) \times X)$   
 $F = +4.3907912E+00$  SIGNIFICANCE OF F = NOT SIGNIFICANT  $\alpha = +1.6370684E+02$   
 $R = -8.3063352E-02$  SIGNIFICANCE OF R = SIGNIFICANT  $\beta = +1.7555805E-01$   
 $t = +2.0954215E+00$  SIGNIFICANCE OF t = SIGNIFICANT  $\gamma = +1.6327013E+02$   
 $N = 634$  DEGREES OF FREEDOM = 632  
 STORAGE CONDITIONS = AMB TEMP/AH TEST CONDITIONS = 77 DEG F, AMB RH



ANB 3066 PROPELLANT (ANB, G POLYMER) RELAX MODULUS • 10 SEC, UNLND CTNS, 3% STN

Figure 6-7

$Y = ((+4.4489366E+02) + (-3.7502569E-01) \times X)$   
 $F = +1.6600376E+01$  SIGNIFICANCE OF F = SIGNIFICANT  $\sigma = +8.6651240E+01$   
 $R = -1.5998172E-01$  SIGNIFICANCE OF R = SIGNIFICANT  $S_e = +9.2045393E-02$   
 $t = +4.0743559E+00$  SIGNIFICANCE OF t = SIGNIFICANT  $S_e = +8.5802813E+01$   
 $N = 634$  DEGREES OF FREEDOM = 632  
 STORAGE CONDITIONS = AMB TEMP/AH TEST CONDITIONS = 77 DEG F, AMB RH



ANB 3066 PROPELLANT (ANB, G POLYMER) RELAX MODULUS • 1000 SEC. UNLND CTNS. 3%

Figure 6-8



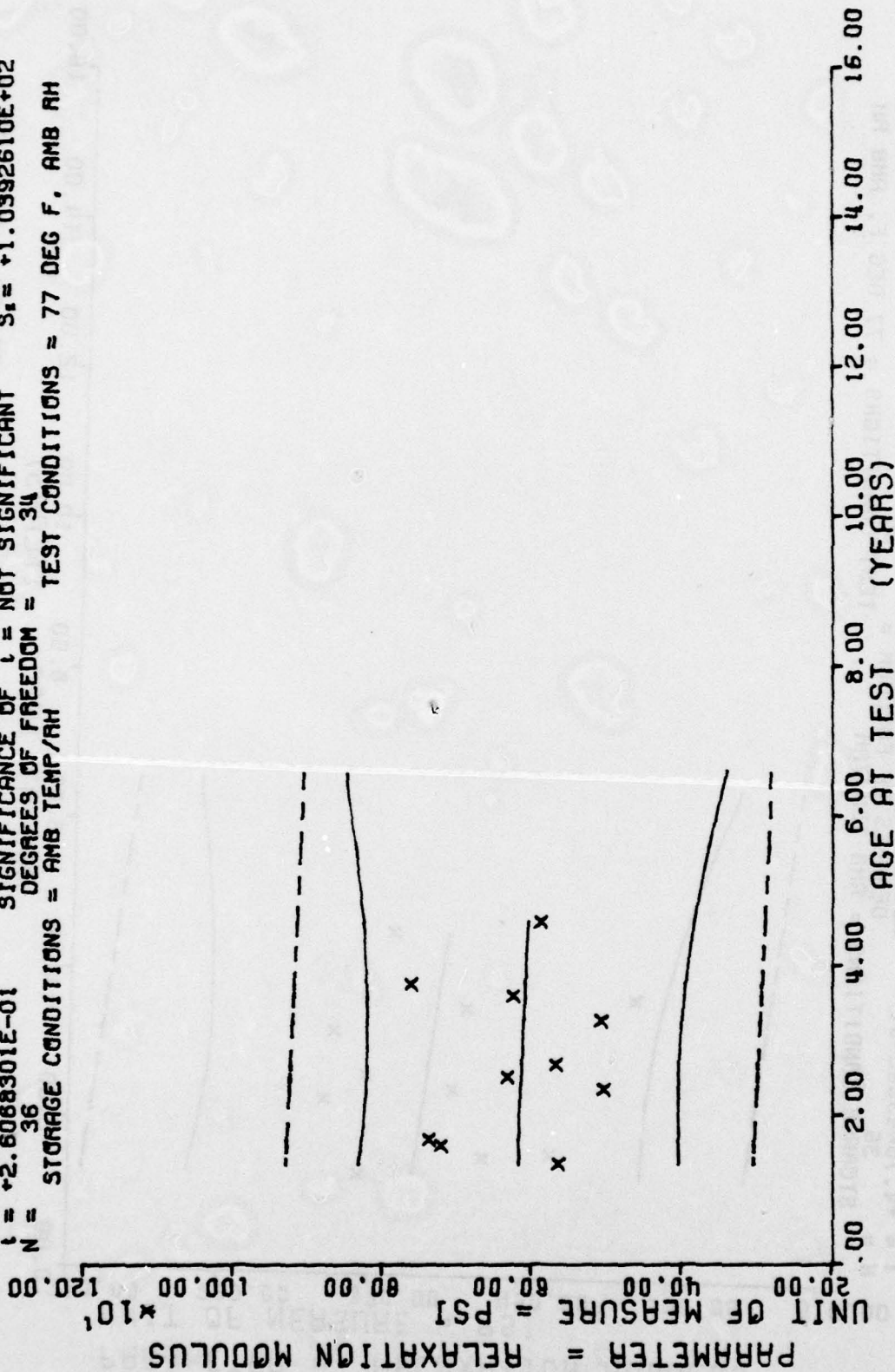
# SAMPLE SIZE SUMMARY

Age (mos)	Nr Samples
16	3
19	3
20	3
28	6
30	6
32	3
39	3
43	3
45	3
55	3

ANB 3066 PROPELLANT (ANB G POLYMER) RELAX MOSULUS @ 10 SEC, 77 DEG, LINED CTNS, 1% STRAIN

This sample size summary is applicable to figures 6-9 and 6-10

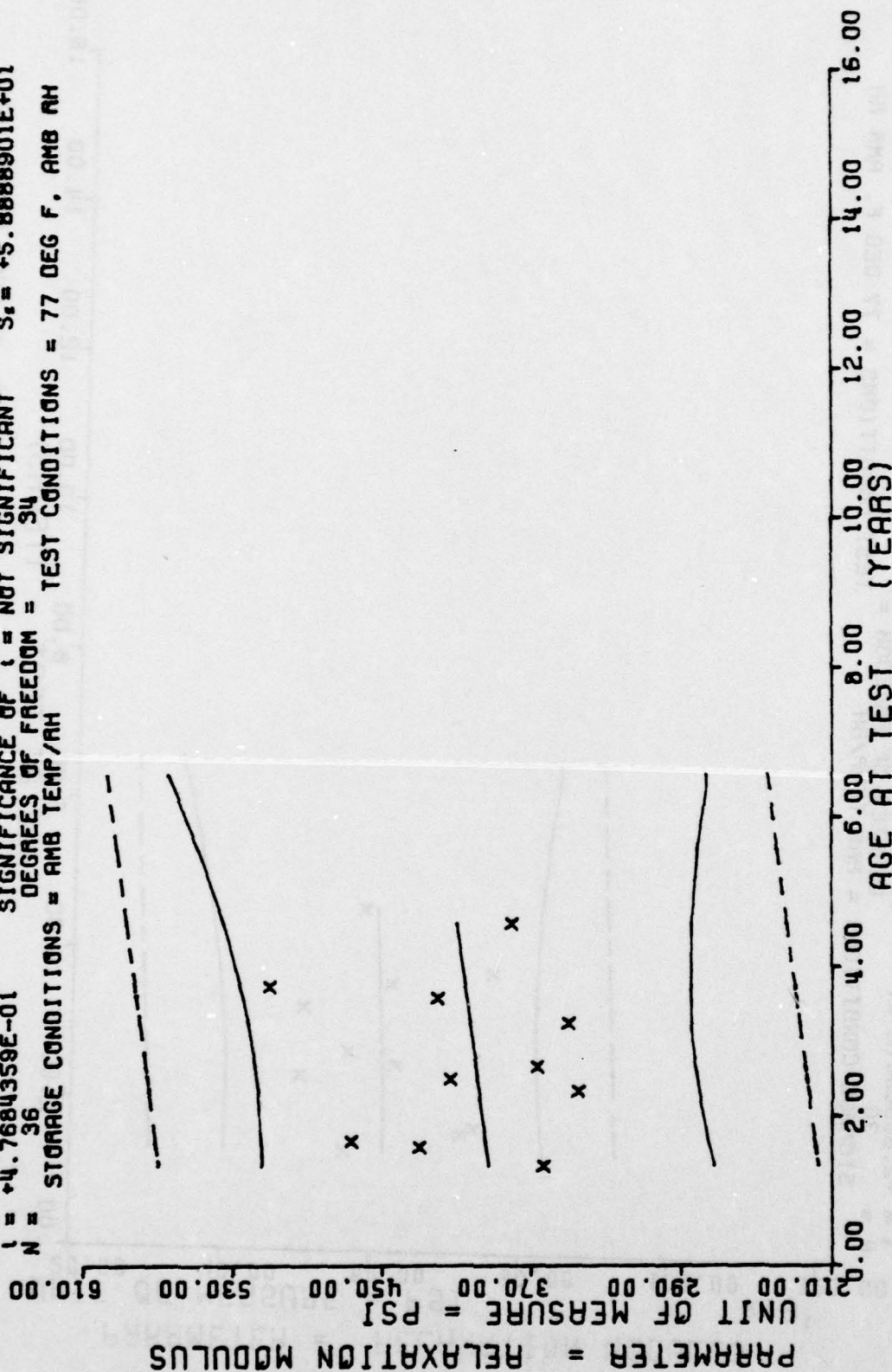
$Y = ((+6.2416915E+02) + (-4.0700408E-01) * X)$   
 $F = +6.7955636E-02$  SIGNIFICANCE OF F = NOT SIGNIFICANT  $G_1 = +1.0253299E+02$   
 $R = -4.4662158E-02$  SIGNIFICANCE OF R = NOT SIGNIFICANT  $S_1 = +1.5612987E+00$   
 $t = +2.6068301E-01$  SIGNIFICANCE OF t = NOT SIGNIFICANT  $S_2 = +1.0992610E+02$   
 $N = 36$  DEGREES OF FREEDOM = 34  
 STORAGE CONDITIONS = AMB TEMP/AH TEST CONDITIONS = 77 DEG F, AMB RH



ANB 3066 PROPELLANT (ANB G POLYMER) RELAX MODULUS @ 10 SEC, 77 DEG, LINED, 1%

Figure 6-9

$Y = ((+3.8674302E+02) + (+4.2186236E-01) * X)$   
 $F = +2.2737981E-01$  SIGNIFICANCE OF F = NOT SIGNIFICANT  $G = +5.8235291E+01$   
 $R = +8.1505914E-02$  SIGNIFICANCE OF R = NOT SIGNIFICANT  $S_1 = +8.8469755E-01$   
 $t = +4.7684359E-01$  SIGNIFICANCE OF t = NOT SIGNIFICANT  $S_2 = +5.8888901E+01$   
 $N = 36$  DEGREES OF FREEDOM = 34  
 STORAGE CONDITIONS = AMB TEMP/AH TEST CONDITIONS = 77 DEG F. AMB RH



ANB 3066 PROPLNT (ANB G POLYMER) RELAX MODULUS • 1000 SEC, 77 DEG, LINED, 1%

Figure 6-10



\*\*\* SAMPLE SIZE SUMMARY \*\*\*

AGE (MYS)	NR SAMP
15	6
18	3
19	10
20	9
22	3
23	3
28	12
30	12
32	6
33	6
43	6
45	6
55	6

ANR 3066 PROPI LNT (ANR G POLYMER) RELAX MODULUS @ 1000 SEC. 77 DEG. LINED. 34

This sample size summary is applicable to figures 6-11 and 6-12

$Y = ((+6.5383071E+02) + (-2.6759111E-01) \times X)$   
 $F = +8.9106054E-02$  SIGNIFICANCE OF F = NOT SIGNIFICANT  $U_0 = +9.2364787E+01$   
 $R = -3.2172107E-02$  SIGNIFICANCE OF R = NOT SIGNIFICANT  $S_0 = +8.9643352E-01$   
 $t = +2.9850637E-01$  SIGNIFICANCE OF t = NOT SIGNIFICANT  $S_t = +9.2852149E+01$   
 $N = 88$  DEGREES OF FREEDOM = 86  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 77 DEG F, AMB RH

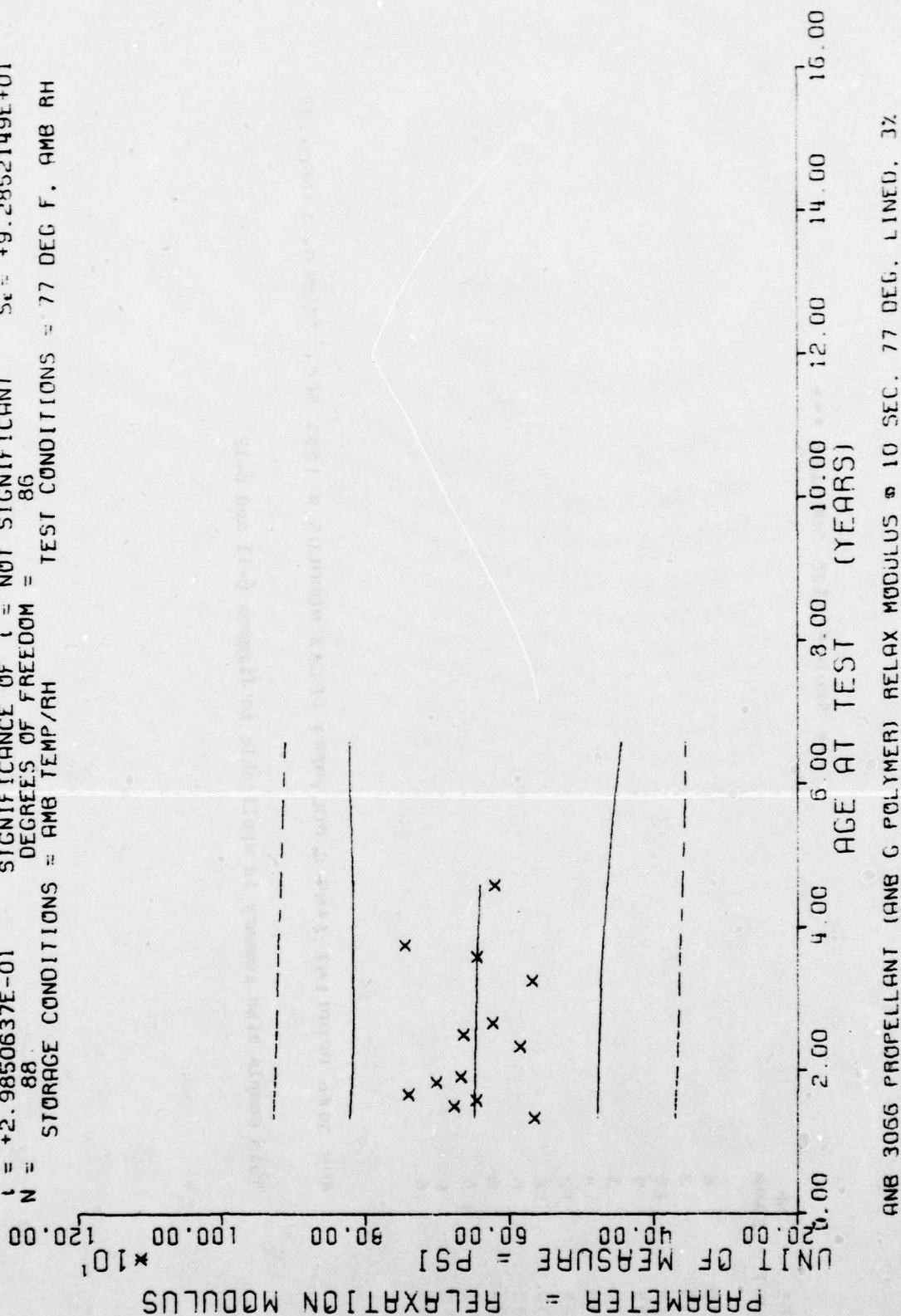
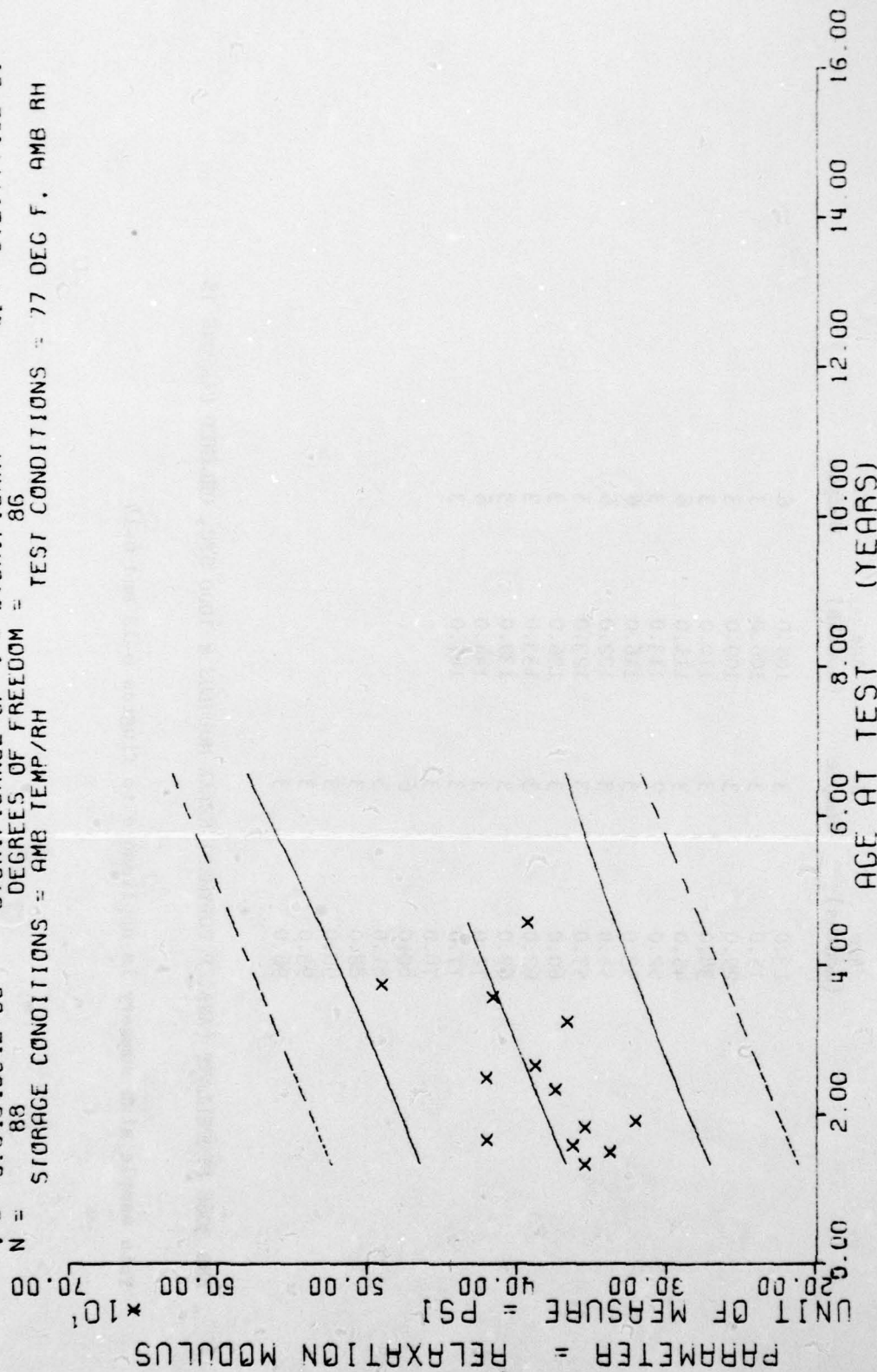


Figure 6-11

$Y = ((+3.4097671E+02) + (+1.6942691E+00) \times X)$   
 $F = +1.1178928E+01$  SIGNIFICANCE OF F = SIGNIFICANT  $S_e = +5.5145708E+01$   
 $R = +3.3916734E-01$  SIGNIFICANCE OF R = SIGNIFICANT  $S_b = +5.0374577E-01$   
 $t = +3.3434904E+00$  SIGNIFICANCE OF t = SIGNIFICANT  $S_t = +5.2177743E+01$   
 $N = 88$  DEGREES OF FREEDOM = 86  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 77 DEG F, AMB RH



AMB 3066 PROPLANT (AMB C POLYMER) RELAX MODULUS @ 1000 SEC, 77 DEG F, AMB RH, 3%

Figure 6-12



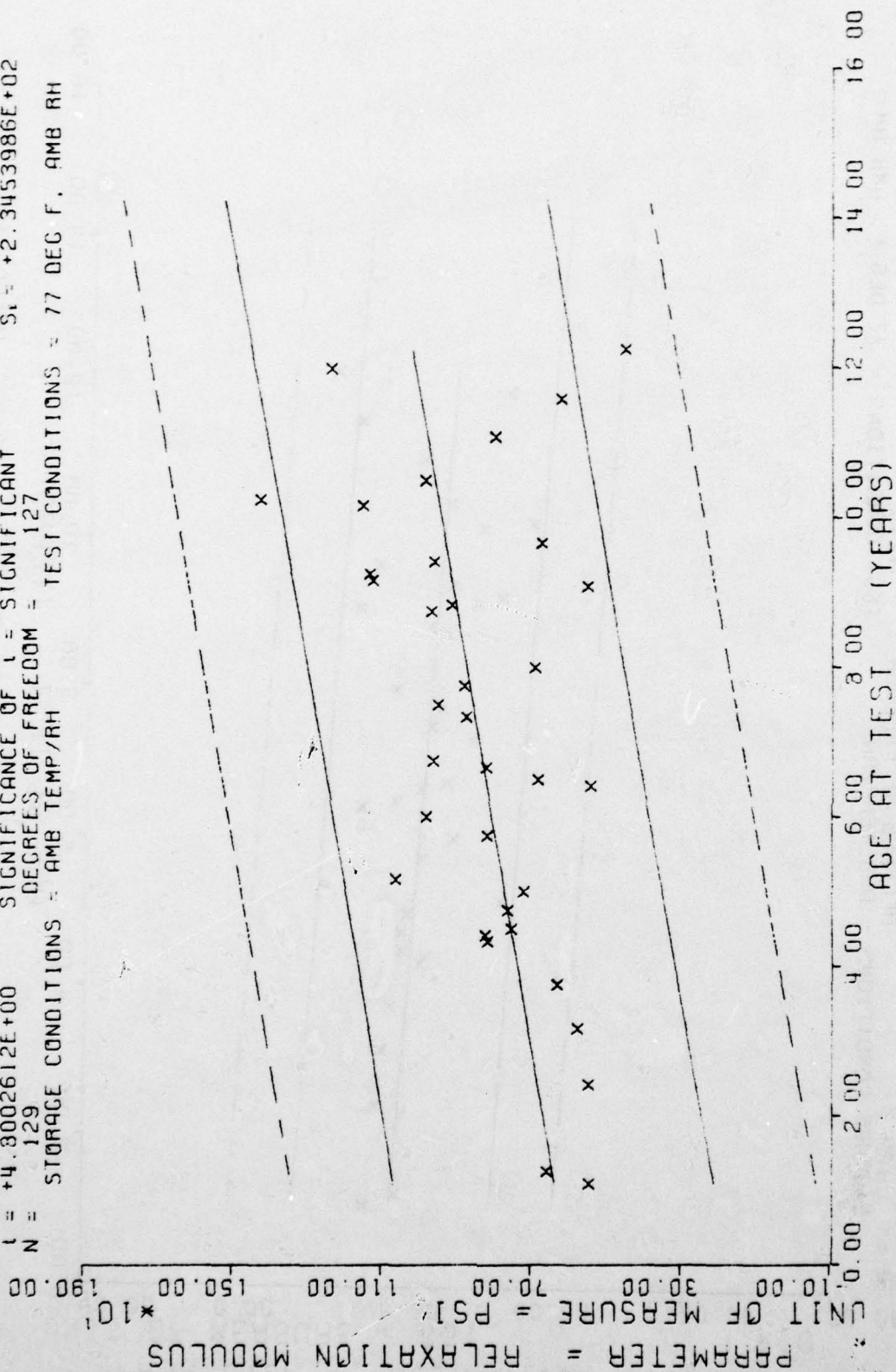
# SAMPLE SIZE SUMMARY

Age (months)	Nr Sample	Age (months)	Nr Sample
13.0	3	105.0	6
15.0	3	106.0	3
29.0	3	109.0	3
38.0	3	110.0	3
45.0	3	111.0	6
52.0	9	113.0	3
53.0	3	116.0	6
54.0	3	122.0	6
57.0	3	123.0	3
60.0	3	126.0	3
62.0	3	133.0	3
69.0	3	139.0	3
72.0	3	144.0	6
77.0	3	147.0	3
78.0	3		
80.0	6		
81.0	3		
88.0	3		
90.0	3		
93.0	3		
96.0	3		

ANB 3066 PROPELLANT (ANB, P POLYMER) RELAX MODULUS @ 1000 SEC, UNLINED CARTONS 1%

This sample size summary is applicable to fiugres 6-13 and 6-14

$Y = (1 + 6.042638E+02) + ( +2.3229460E+00 ) \times X$   
 $F = +2.3042508E+01$  SIGNIFICANCE OF F = SIGNIFICANT  $G_1 = +2.5393282E+02$   
 $R = +3.918416E-01$  SIGNIFICANCE OF R = SIGNIFICANT  $S_a = +5.8808175E-01$   
 $t = +4.3002612E+00$  SIGNIFICANCE OF t = SIGNIFICANT  $S_t = +2.3453986E+02$   
 $N = 129$  DEGREES OF FREEDOM = 127  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 77 DEG F, AMB RH



$Y = ((+4.0512396E+02) + (+1.1297966E+00) * X)$   
 $F = +9.6862878E+00$  SIGNIFICANCE OF F = SIGNIFICANT  $G = +1.4960910E+02$   
 $R = +2.6620500E-01$  SIGNIFICANCE OF R = SIGNIFICANT  $S_0 = +3.6301249E-01$   
 $t = +3.1122801E+00$  SIGNIFICANCE OF t = SIGNIFICANT  $S_t = +1.4477732E+02$   
 $N = 129$  DEGREES OF FREEDOM = 127  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 77 DEG F, AMB RH

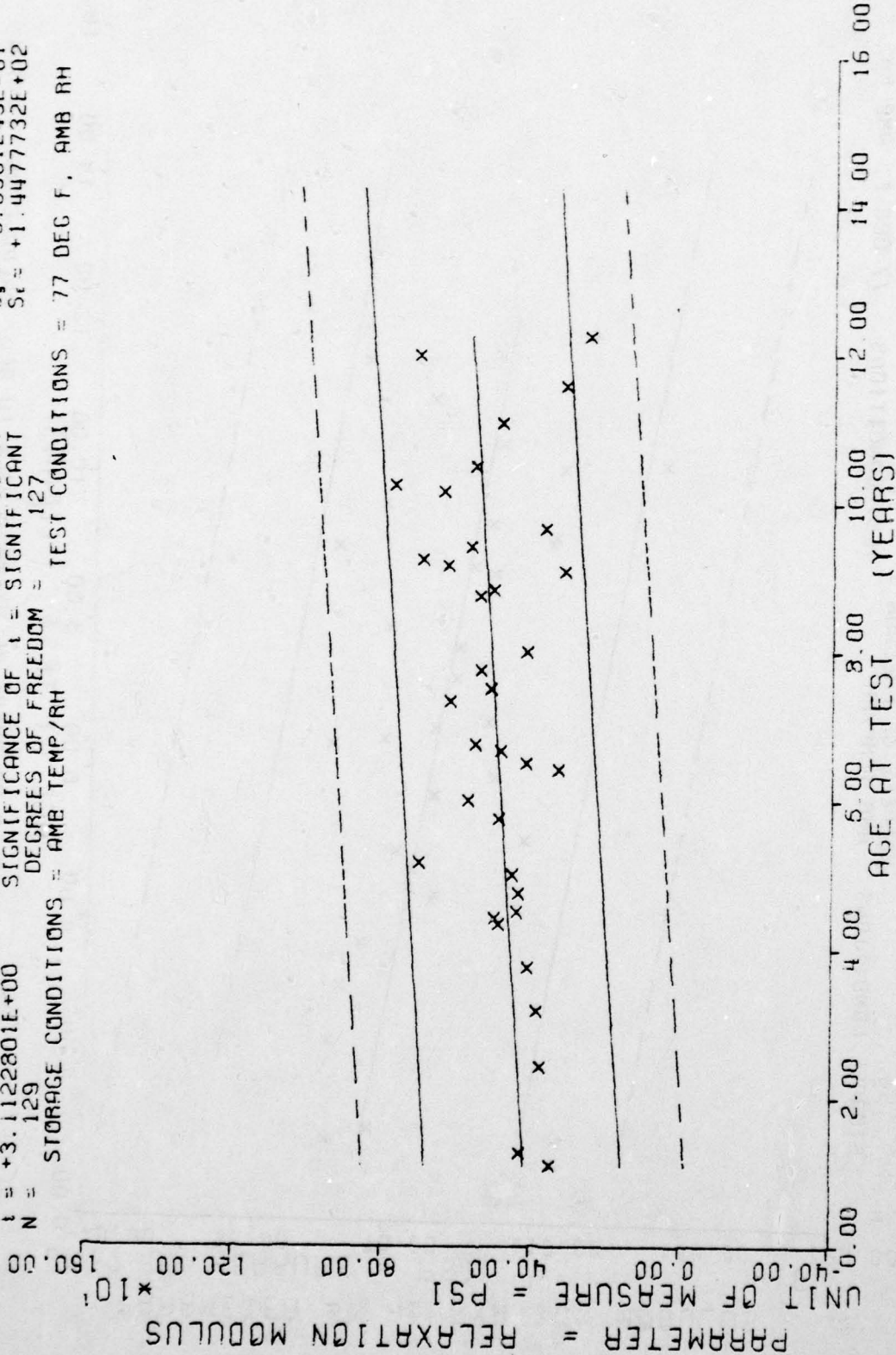


Figure 6-14



\*\*\* SAMPLE SIZE SUMMARY \*\*\*

AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP
13	20	51	3	37	6	147	6
14	2	52	18	88	6		
15	14	53	6	92	3		
17	15	54	6	90	6		
18	19	55	3	91	6		
19	24	57	6	93	6		
20	12	60	6	94	6		
21	8	62	6	95	6		
22	6	63	3	100	6		
23	3	65	6	103	3		
24	3	66	3	104	3		
25	3	67	3	105	15		
26	10	69	9	106	6		
27	2	70	12	108	3		
28	3	71	9	109	3		
29	6	72	5	110	6		
30	3	76	3	111	12		
33	5	77	6	113	3		
35	3	78	6	115	12		
36	3	80	15	122	12		
38	6	81	6	123	6		
42	6	82	3	126	6		
45	6	83	5	133	5		
46	3	85	3	139	5		
47	3	86	3	144	12		

ANR 3066 PROPELLANT (ANR, P POLYMER) RELAX MODULUS @ 10 SEC, UNIND CTNS, 3% STN

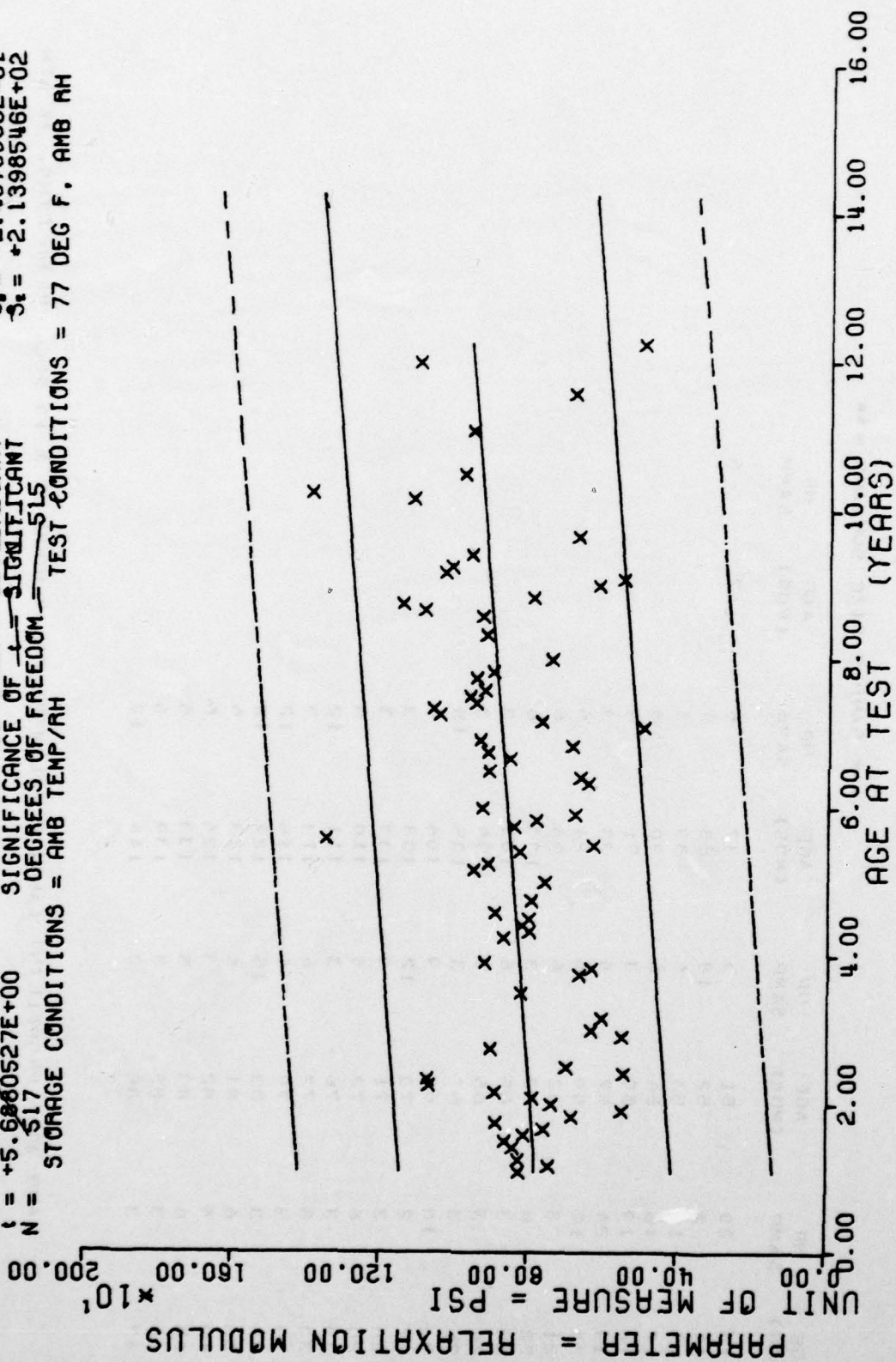
This sample size summary is applicable to figures 6-15 and 6-16

$F = +9.2353948E+01$   
 $R = +2.4312492E-01$   
 $t = +5.6260527E+00$   
 $N = 517$

STORAGE CONDITIONS = AMB TEMP/AH  
 TEST CONDITIONS = 77 DEG F, AMB RH

$- (( +7.6386490E+02 ) \times X)$   
 SIGNIFICANCE OF  $X$  = SIGNIFICANT  
 SIGNIFICANCE OF  $A$  = SIGNIFICANT  
 SIGNIFICANCE OF  $L$  = SIGNIFICANT  
 DEGREES OF FREEDOM = 515

$G = +2.2039084E+02$   
 $S_0 = +2.4070506E-01$   
 $S_1 = +2.1398546E+02$



AN8 3066 PROPELLANT (AN8, P POLYMER) RELAX MODULUS @ 10 SEC, UNLND CTNS, 3% STN

Figure 6-15

$Y = ((+4.6026470E+02) + (+4.4720218E-01) \times X)$   
 $F = +9.9537116E+00$  SIGNIFICANCE OF F = SIGNIFICANT  
 $R = +1.3769939E-01$  SIGNIFICANCE OF R = SIGNIFICANT  
 $t = +3.1549503E+00$  SIGNIFICANCE OF t = SIGNIFICANT  
 $N = 517$  DEGREES OF FREEDOM = 515  
 STORAGE CONDITIONS = AMB TEMP/AH TEST CONDITIONS = 77 DEG F, AMB RH

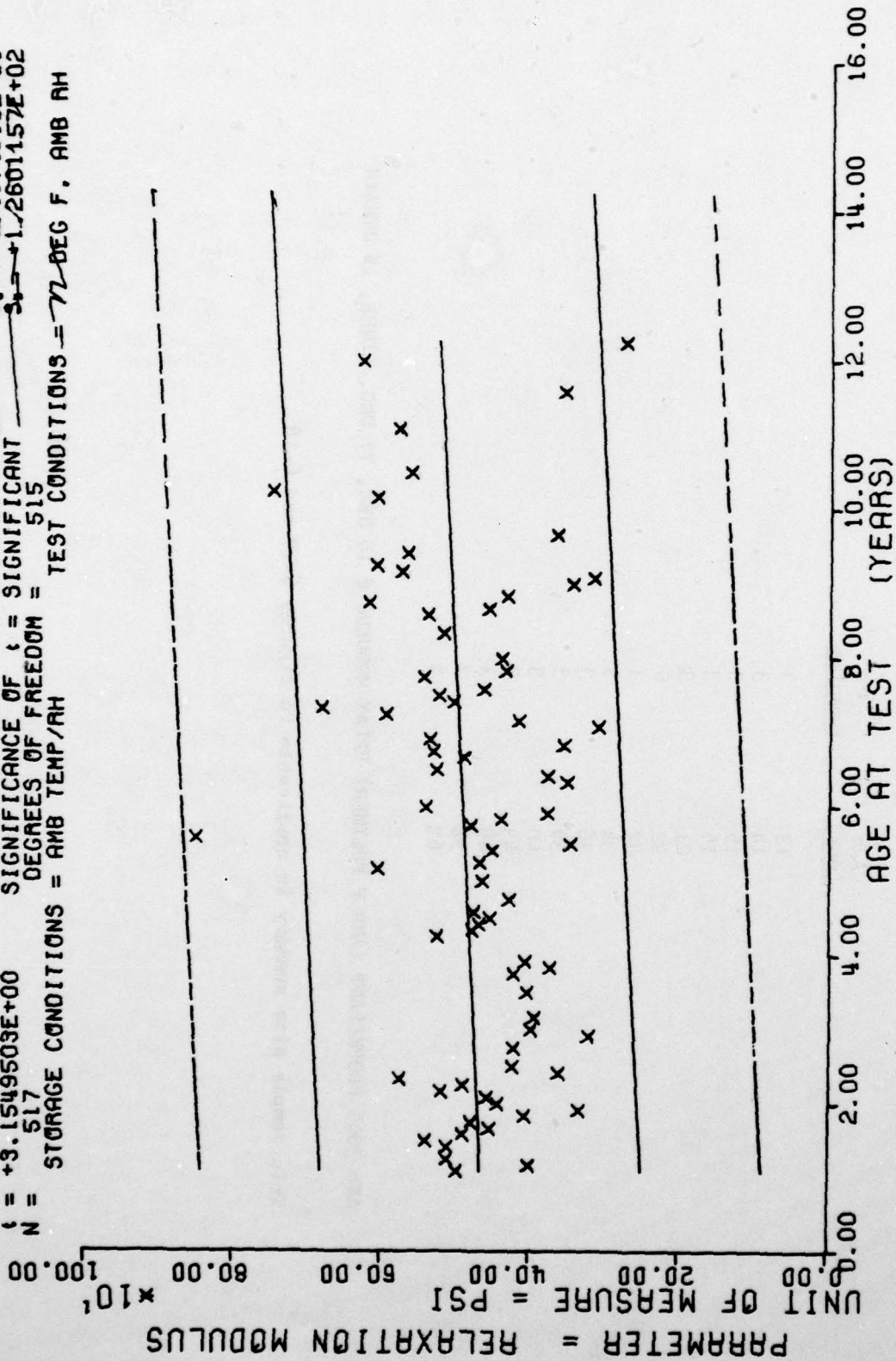


Figure 6-16



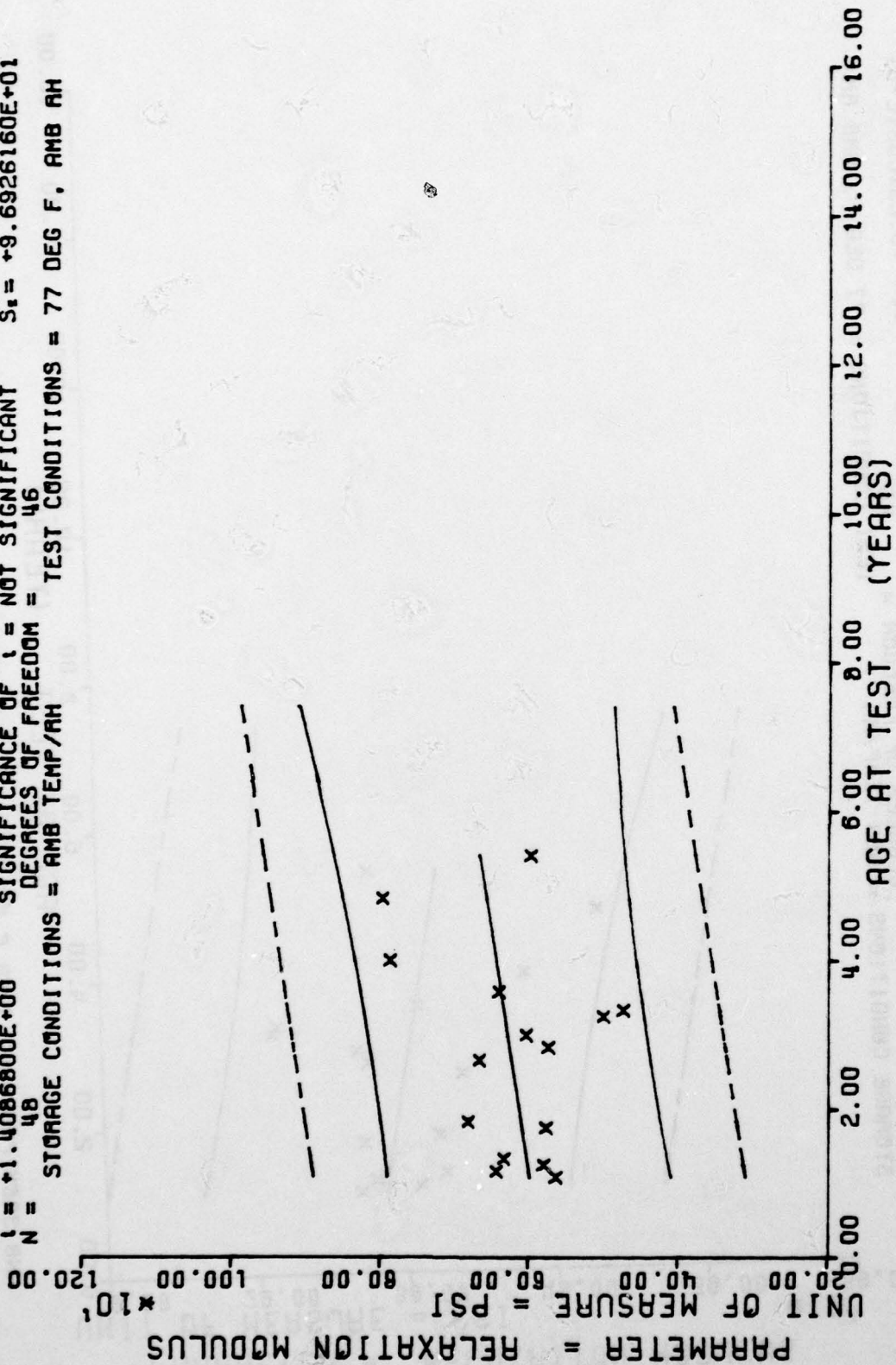
# SAMPLE SIZE SUMMARY

Age (mos)	Nr Samples
13	3
14	3
15	3
16	3
21	3
22	6
32	3
34	3
36	3
39	3
40	3
43	3
48	3
58	3
63	3

ANB 3066 PROPELLANT (ANB P POLYMER) RELAX MODULUS @ 10 SEC, 77 DEG, LINED, 1% STRAIN

This sample size summary is applicable to figures 6-17 and 6-18

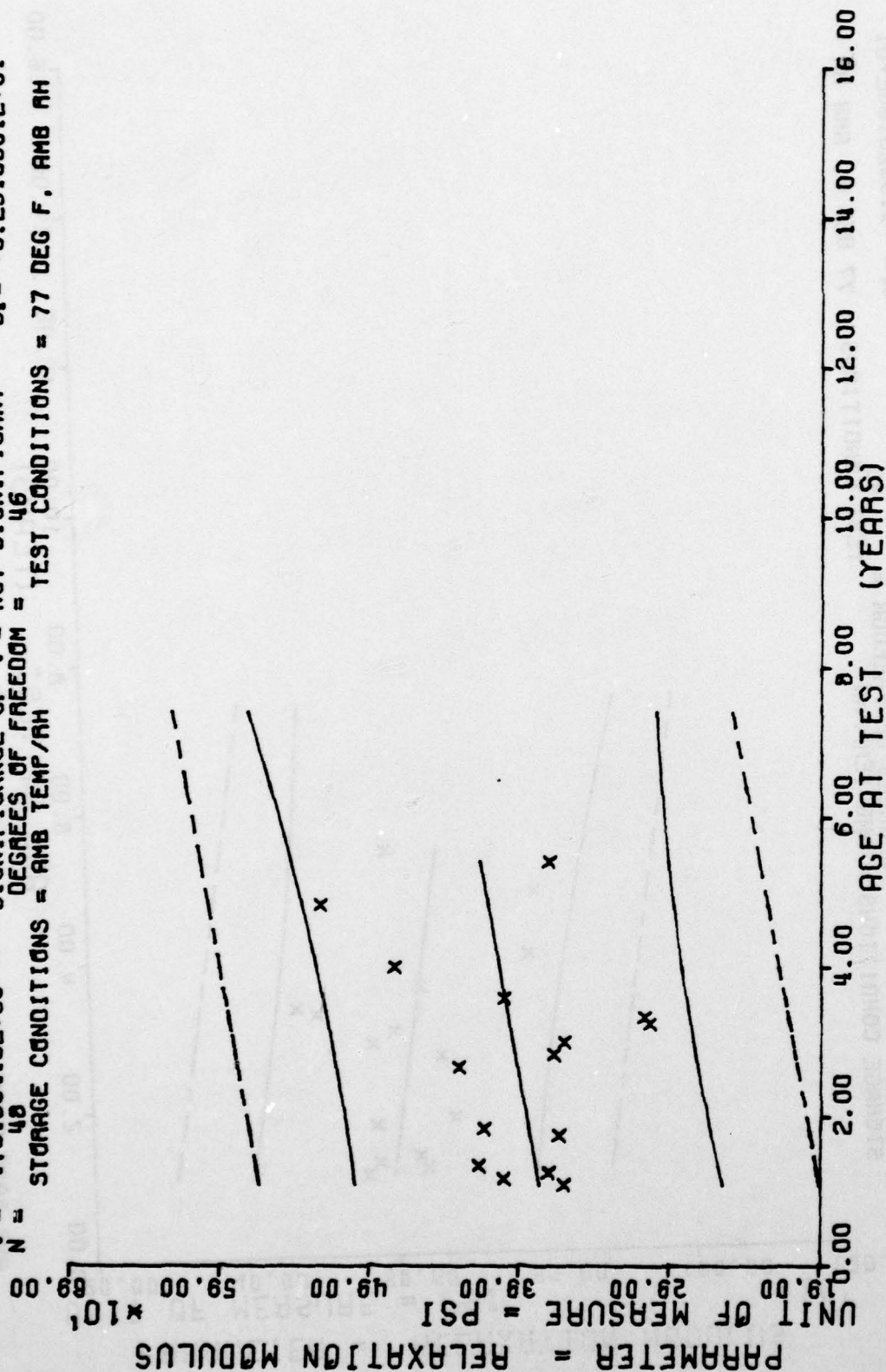
$Y = ((+5.8351945E+02) + (+1.2748174E+00) \times X)$   
 $F = +1.9843795E+00$  SIGNIFICANCE OF F = NOT SIGNIFICANT  $\alpha = +9.7935923E+01$   
 $R = +2.0335854E-01$  SIGNIFICANCE OF R = NOT SIGNIFICANT  $S_e = +9.0497302E-01$   
 $t = +1.4086800E+00$  SIGNIFICANCE OF t = NOT SIGNIFICANT  $S_e = +9.6926160E+01$   
 $N = 48$  DEGREES OF FREEDOM = 46  
 STORAGE CONDITIONS = AMB TEMP/AH TEST CONDITIONS = 77 DEG F, AMB RH



AMB 3066 PROPELLANT (AMB P POLYMER) RELAX MODULUS • 10 SEC, 77 DEG, LINED, 1Z

Figure 6-17

$F = +1.7332810E+00$  SIGNIFICANCE OF  $F =$  ( +3.6707780E+02 ) + ( +7.6593658E-01 ) \* X)  
 $R = +1.9055653E-01$  SIGNIFICANCE OF  $R =$  NOT SIGNIFICANT  $\sigma = +6.2795048E+01$   
 $t = +1.3165413E+00$  SIGNIFICANCE OF  $t =$  NOT SIGNIFICANT  $S_e = +5.8177936E-01$   
 $N = 48$  DEGREES OF FREEDOM = 46  $S_r = +6.2310851E+01$   
 STORAGE CONDITIONS = AMB TEMP/AH TEST CONDITIONS = 77 DEG F, AMB AH



ANB 3066 PROPELLANT (ANB P POLYMER) RELAX MODULUS • 1000 SEC, 77 DEG, LINED, 1%

Figure 6-18



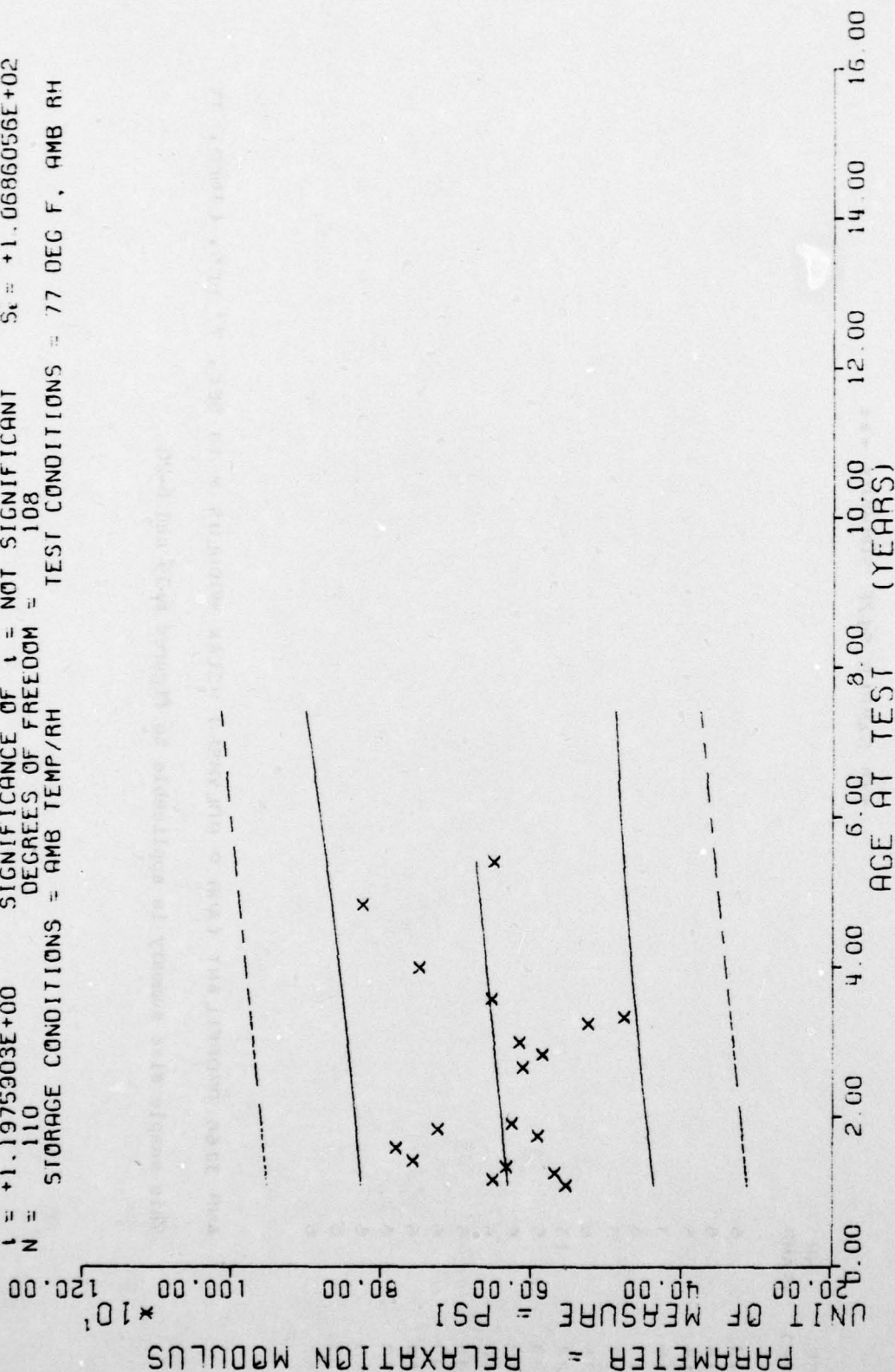
\*\*\* SAMPLE SIZE SUMMARY \*\*\*

AGE (MOS)	NP SAMP
13	6
14	6
15	5
16	3
17	6
19	3
21	6
22	15
23	5
22	6
34	5
35	6
37	6
40	6
43	6
48	6
59	6
65	6

ANR 3066 PROPELLANT (ANR P POLYMER) RELAX MODULUS @ 10 SEC. 77 DEG. LINED. 3%

This sample size summary is applicable to figures 6-19 and 6-20

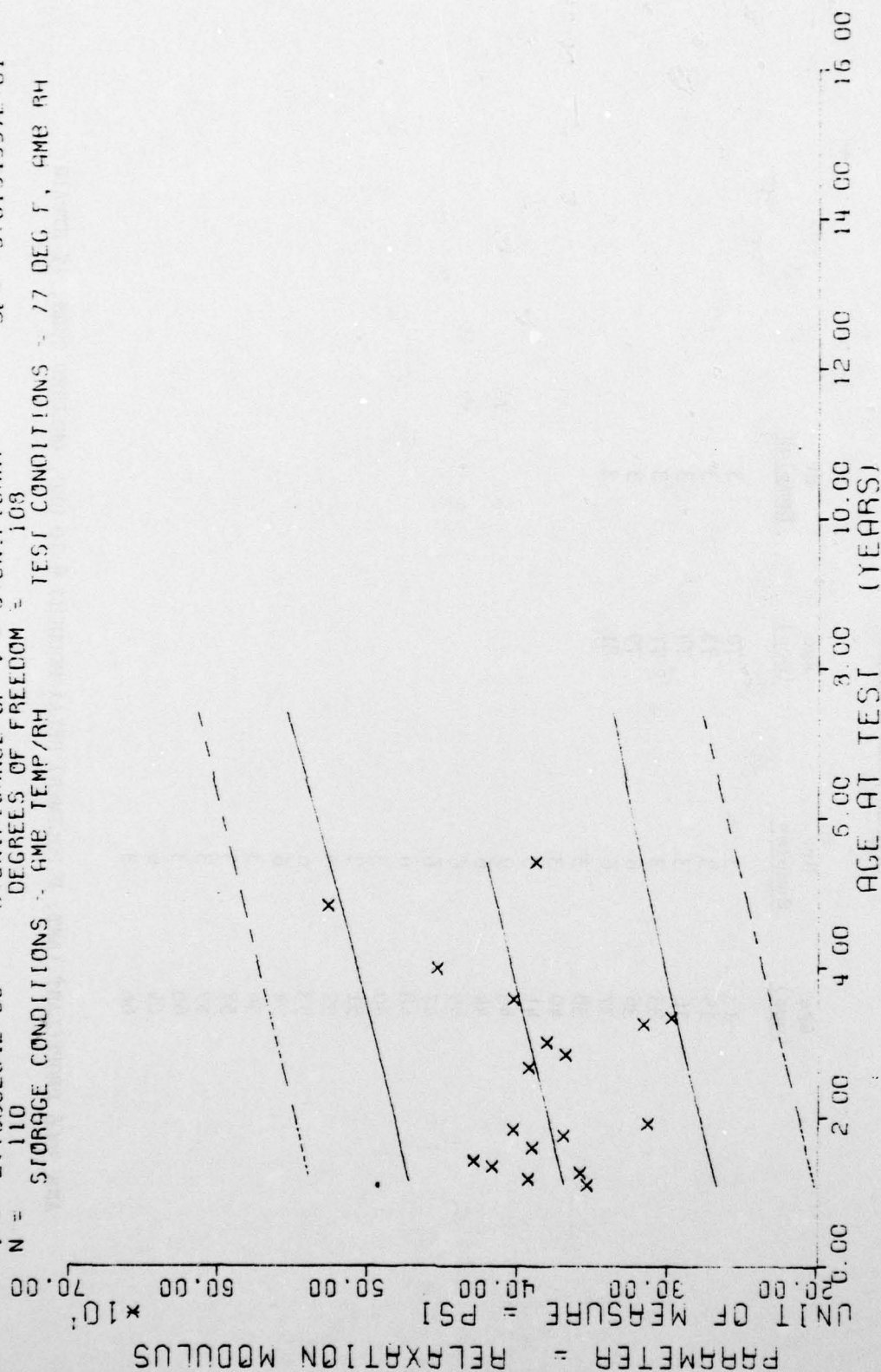
$F = +1.4342225E+00$  SIGNIFICANCE OF  $F = (+6.2188072E+02)$  + (+8.1562349E-01) \* X)  
 $R = +1.1448054E-01$  SIGNIFICANCE OF  $R =$  NOT SIGNIFICANT  $S_e = +1.0707320E+02$   
 $t = +1.1975903E+00$  SIGNIFICANCE OF  $t =$  NOT SIGNIFICANT  $S_b = +6.8105385E-01$   
 $N = 110$  DEGREES OF FREEDOM = 108  $S_c = +1.0686056E+02$   
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 77 DEG F, AMB RH



ANB 3056 PROPELLANT (AMB P POLYMER) RELAX MODULUS @ 10 SEC. 77 DEG. LINEO. 3%

Figure 6-19

$F = +7.7730579E+00$   
 $R = +2.5911478E-01$   
 $t = +2.7880204E+00$   
 $N = 110$   
 STORAGE CONDITIONS - 4MB TEMP/RH  
 DEGREES OF FREEDOM = 103  
 $Y = ((+3.5651500E+02) + ((+9.9745578E-01) * X))$   
 $G_1 = +5.7852776E+01$   
 $S_1 = +3.5776437E-01$   
 $S_2 = +5.6134997E+01$



ANB 3055 PROPLNT (ANB P POLYMER) RELAX MODULUS @ 1000 SEC. 77 DEG. LINE, 32

Figure 6-20



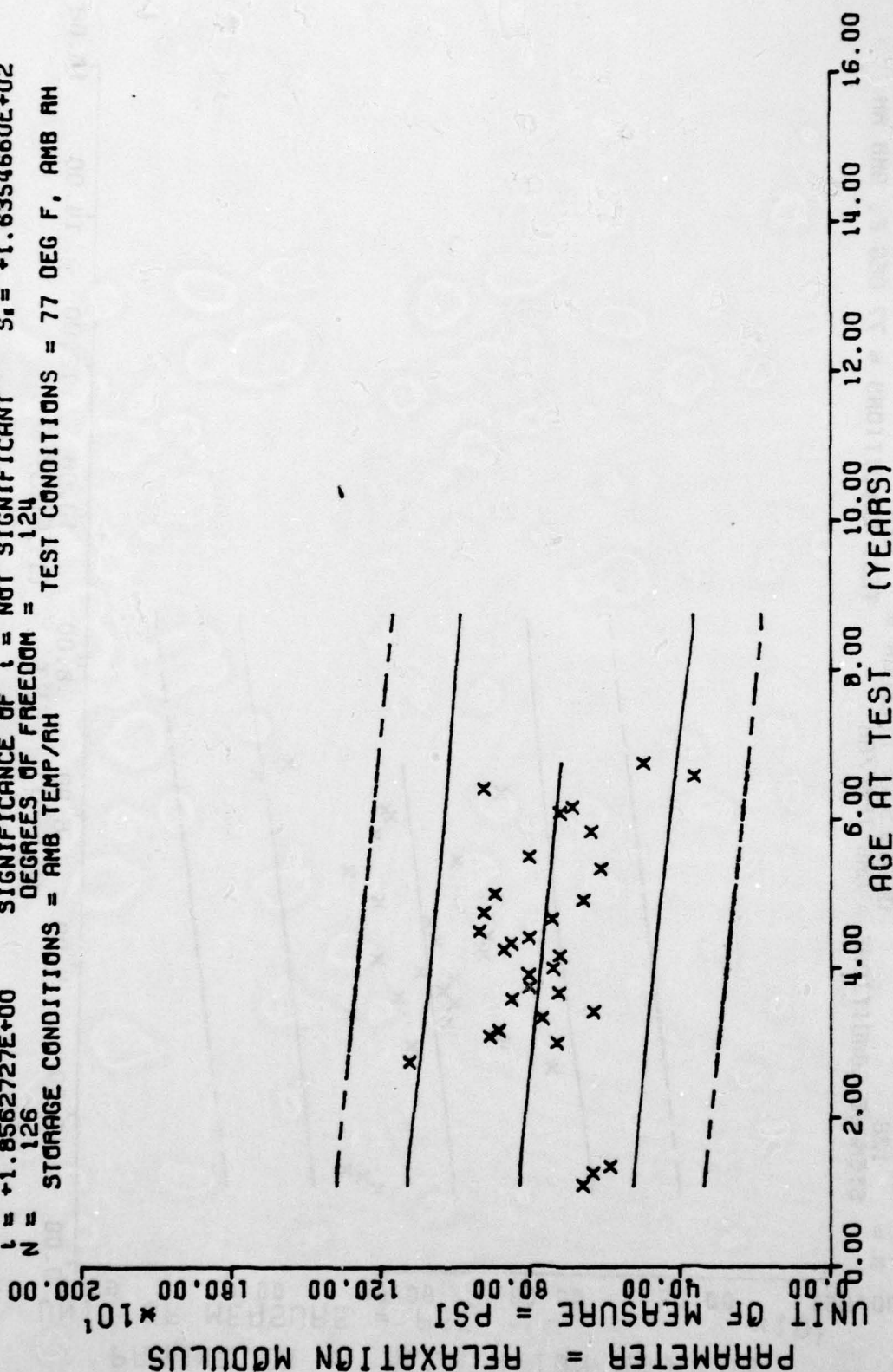
# SAMPLE SIZE SUMMARY

<u>Age (mos)</u>	<u>Nr Samples</u>	<u>Age (mos)</u>	<u>Nr Samples</u>
13	3	70	3
15	3	73	3
16	3	74	3
33	3	77	3
36	6	79	3
37	6	81	3
38	3		
40	3		
41	3		
43	9		
44	6		
45	6		
47	6		
48	6		
50	3		
51	3		
52	3		
53	6		
54	6		
56	3		
57	3		
59	3		
60	3		
64	6		
66	3		

ANB 3066 PROPELLANT (ANT, P POLYMER) RELAX MODULUS @ 10 SEC, UNLINED CTNS, 1% STRAIN

This sample size summary is applicable to figures 6-21 and 6-22

$F = +3.4457485E+00$  SIGNIFICANCE OF F = NOT SIGNIFICANT  $G_1 = +1.6513882E+02$   
 $R = -1.6442926E-01$  SIGNIFICANCE OF R = NOT SIGNIFICANT  $S_1 = +9.2637548E-01$   
 $L = +1.8562727E+00$  SIGNIFICANCE OF L = NOT SIGNIFICANT  $S_2 = +1.6354660E+02$   
 $N = 126$  DEGREES OF FREEDOM = 124  
 STORAGE CONDITIONS = AMB TEMP/AH TEST CONDITIONS = 77 DEG F, AMB AH



ANB 3066 PROPELLANT (ANT, P POLYMER) RELAX MODULUS • 10 SEC, UNLND CTNS, 1X STN

Figure 6-21

AD-A080 581

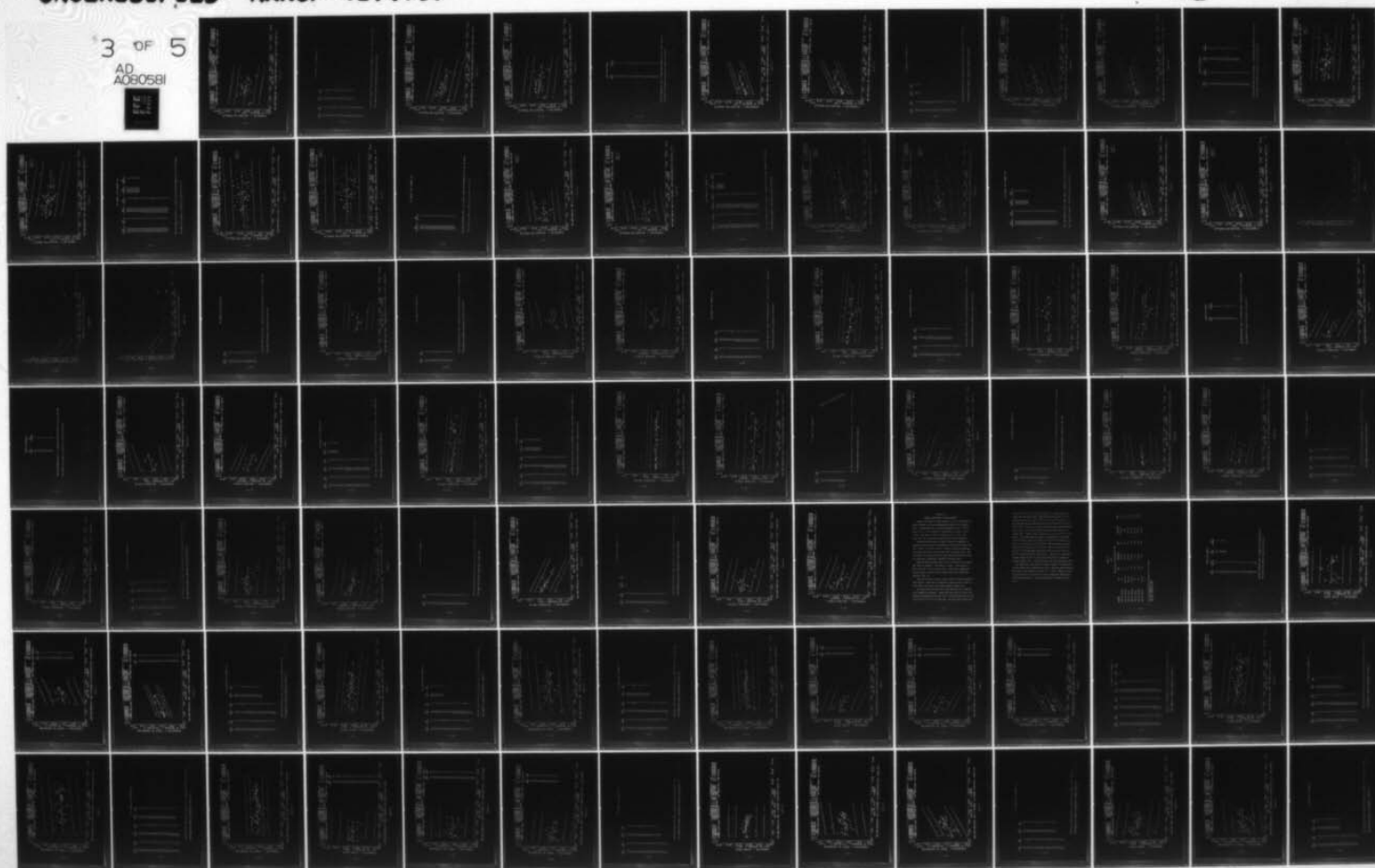
OGDEN AIR LOGISTICS CENTER HILL AFB UT PROPELLANT LAB--ETC F/G 21/9.2  
PROPELLANT SURVEILLANCE REPORT ANB-3066 PROPELLANT.(U)

UNCLASSIFIED NOV 79 E M DALABA  
MANCP-417(79)

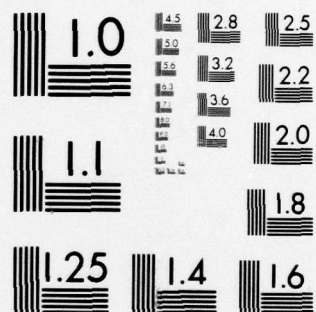
NL

3 OF 5

AD  
A080581

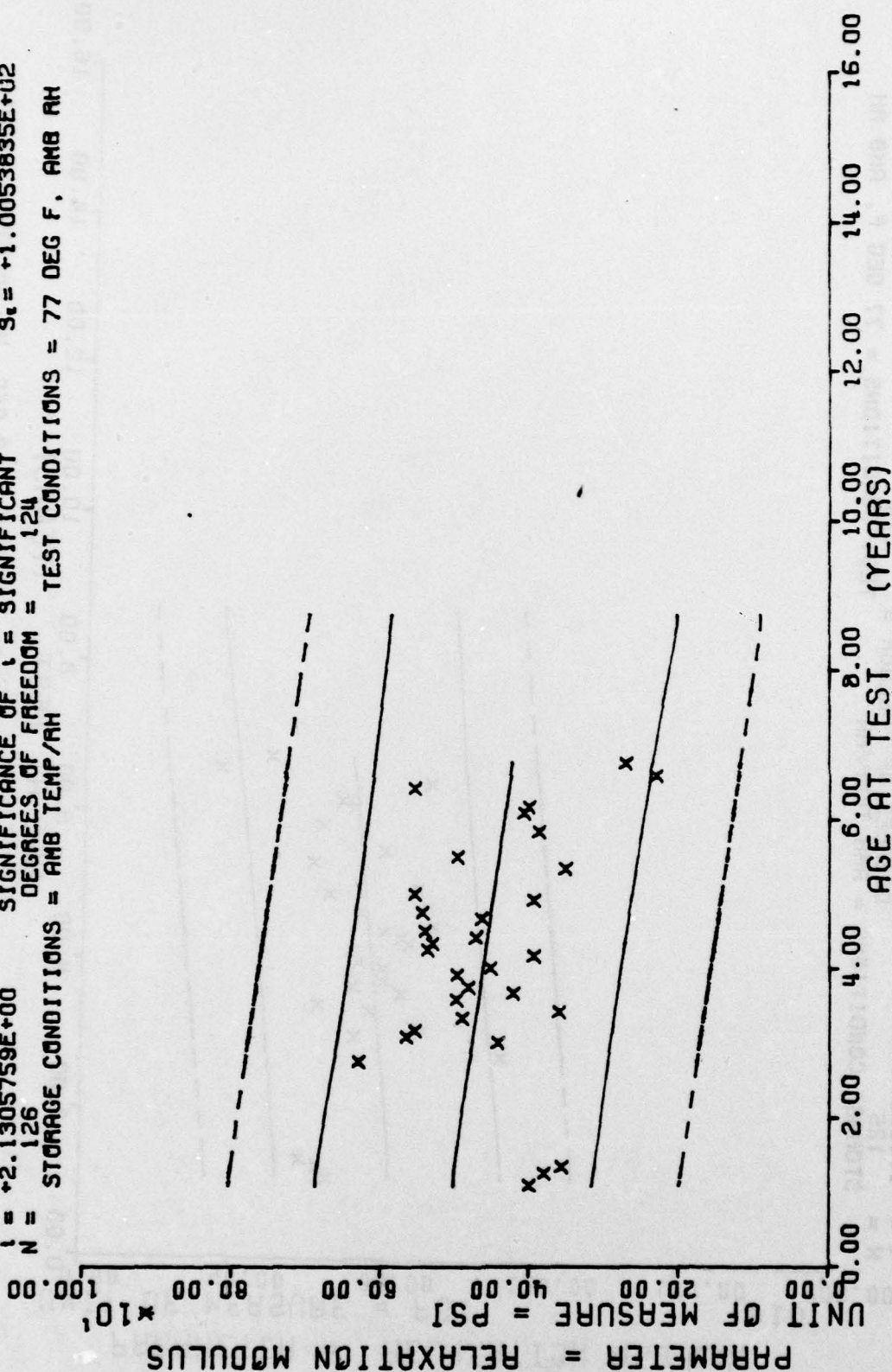






MICROCOPY RESOLUTION TEST CHART  
NATIONAL BUREAU OF STANDARDS-1963-A

$Y = ((+5.1891220E+02) + (-1.2133170E+00) * X)$   
 $F = +4.5393539E+00$  SIGNIFICANCE OF F = .7 SIGNIFICANT  $G = +1.0195177E+02$   
 $R = -1.8792258E-01$  SIGNIFICANCE OF R = .9 SIGNIFICANT  $S = +5.6947844E-01$   
 $t = +2.1305759E+00$  SIGNIFICANCE OF t = .03 SIGNIFICANT  $g = +1.0053835E+02$   
 $N = 126$  DEGREES OF FREEDOM = 124  
 STORAGE CONDITIONS = AMB TEMP/AH TEST CONDITIONS = 77 DEG F, AMB RH



ANB 3066 PROPELLANT (ANT, P POLYMER) RELAX MODULUS @ 1000 SEC, UNLND CTNS 1/2 ST

Figure 6-22

\*\*\* SAMPLE SIZE SUMMARY \*\*\*

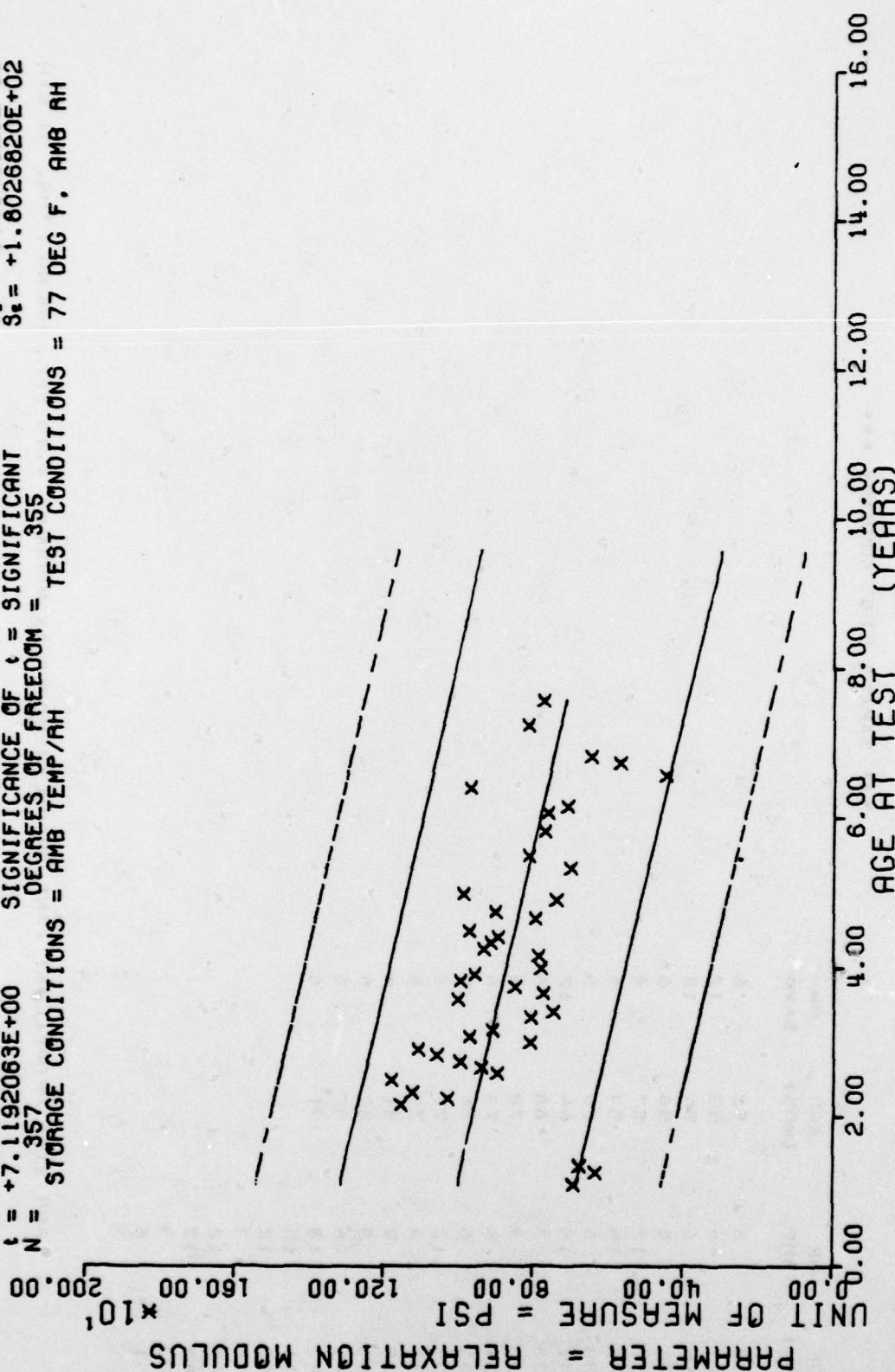
AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP
13	6	52	6
15	6	53	12
16	6	54	12
26	6	56	6
27	12	57	6
29	18	59	6
30	6	60	6
31	15	64	12
32	3	66	6
33	9	70	6
34	6	73	6
35	6	74	6
36	12	77	6
37	9	79	6
39	9	81	6
40	9	82	6
41	6	87	6
43	18	91	6
44	15		
45	12		
46	3		
47	12		
48	12		
50	9		
51	6		

AND 306A PROPELLANT (ANT. P POLYMER) RELAX MODULUS  $\approx$  10 SEC. UNLND CTNS. 3% STN

This sample size summary is applicable to figures 6-23 and 6-24



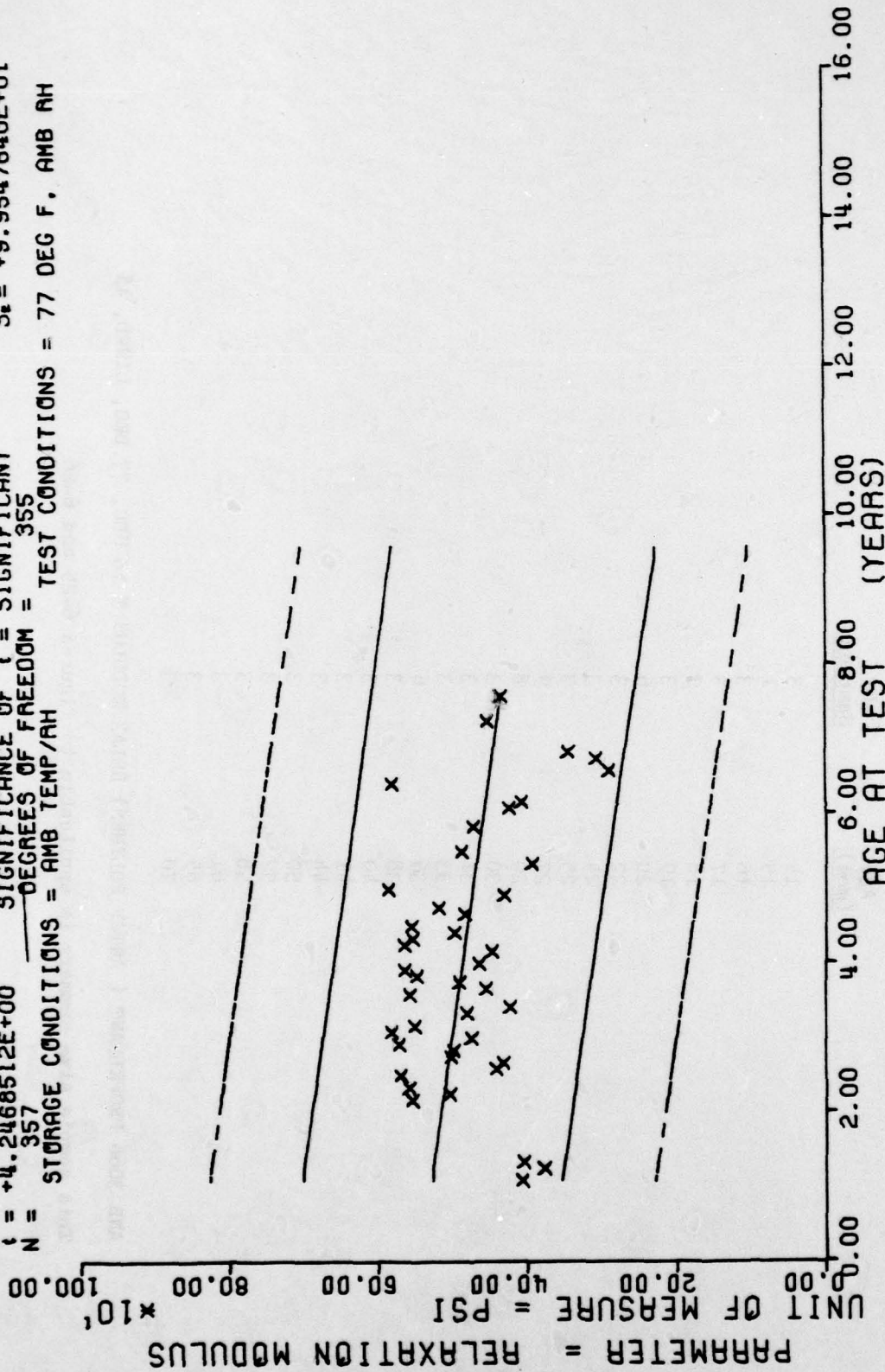
$F = +5.0683098E+01$   
 $R = -3.5345824E-01$   
 $t = +7.1192063E+00$   
 $N = 357$   
 $Y = ((+1.0513943E+03) + (-3.7765198E+00) \times X)$   
 SIGNIFICANCE OF F = SIGNIFICANT  
 SIGNIFICANCE OF R = SIGNIFICANT  
 SIGNIFICANCE OF t = SIGNIFICANT  
 DEGREES OF FREEDOM = 355  
 STORAGE CONDITIONS = AMB TEMP/AH  
 TEST CONDITIONS = 77 DEG F, AMB RH



AMB 3066 PROPELLANT (ANT. P POLYMER) RELAX MODULUS • 10 SEC, UNLND CTNS, 3% STN

Figure 6-23

$F = +1.8035745E+01$       SIGNIFICANCE OF  $F =$  SIGNIFICANT       $\sigma_1 = +1.0190164E+02$   
 $R = -2.1988308E-01$       SIGNIFICANCE OF  $R =$  SIGNIFICANT       $S_0 = +2.9293550E-01$   
 $t = +4.2468512E+00$       SIGNIFICANCE OF  $t =$  SIGNIFICANT       $S_2 = +9.9547640E+01$   
 $N = 357$       DEGREES OF FREEDOM = 355  
 STORAGE CONDITIONS = AMB TEMP/AH      TEST CONDITIONS = 77 DEG F, AMB RH



ANB 3066 PROPELLANT (ANT, P POLYMER) RELAX MODULUS • 1000 SEC, UNLND CTNS 3% ST

Figure 6-24

# SAMPLE SIZE SUMMARY

Age (mos)	Nr Samples
14	3
15	1
16	3
17	3
18	3
19	3
20	6
22	3
24	3
25	3
27	9
29	8
30	3
31	3
33	3
36	6
38	3
40	3
41	3
44	3
50	3
52	3
58	3
61	3
65	3
70	3

ANB 3066 PROPELLANT ( ANT P POLYMER) RELAX MODULUS @ 10 SEC, 77 DEG, LINED, 1%

This sample size summary is applicable to figures 6-25 and 6-26



$Y = ((+5.1714725E+02) + (+5.6758162E+00) \times X)$   
 $F = +6.3066244E+01$  SIGNIFICANCE OF F = SIGNIFICANT  $\sigma^2 = +1.3324500E+02$   
 $R = +6.3980073E-01$  SIGNIFICANCE OF R = SIGNIFICANT  $S_e = +7.1470987E-01$   
 $t = +7.9414258E+00$  SIGNIFICANCE OF t = SIGNIFICANT  $S_e = +1.0296534E+02$   
 $N = 83$  DEGREES OF FREEDOM = 91  
 STORAGE CONDITIONS = AMB TEMP/AH TEST CONDITIONS = 77 DEG F, AMB AH

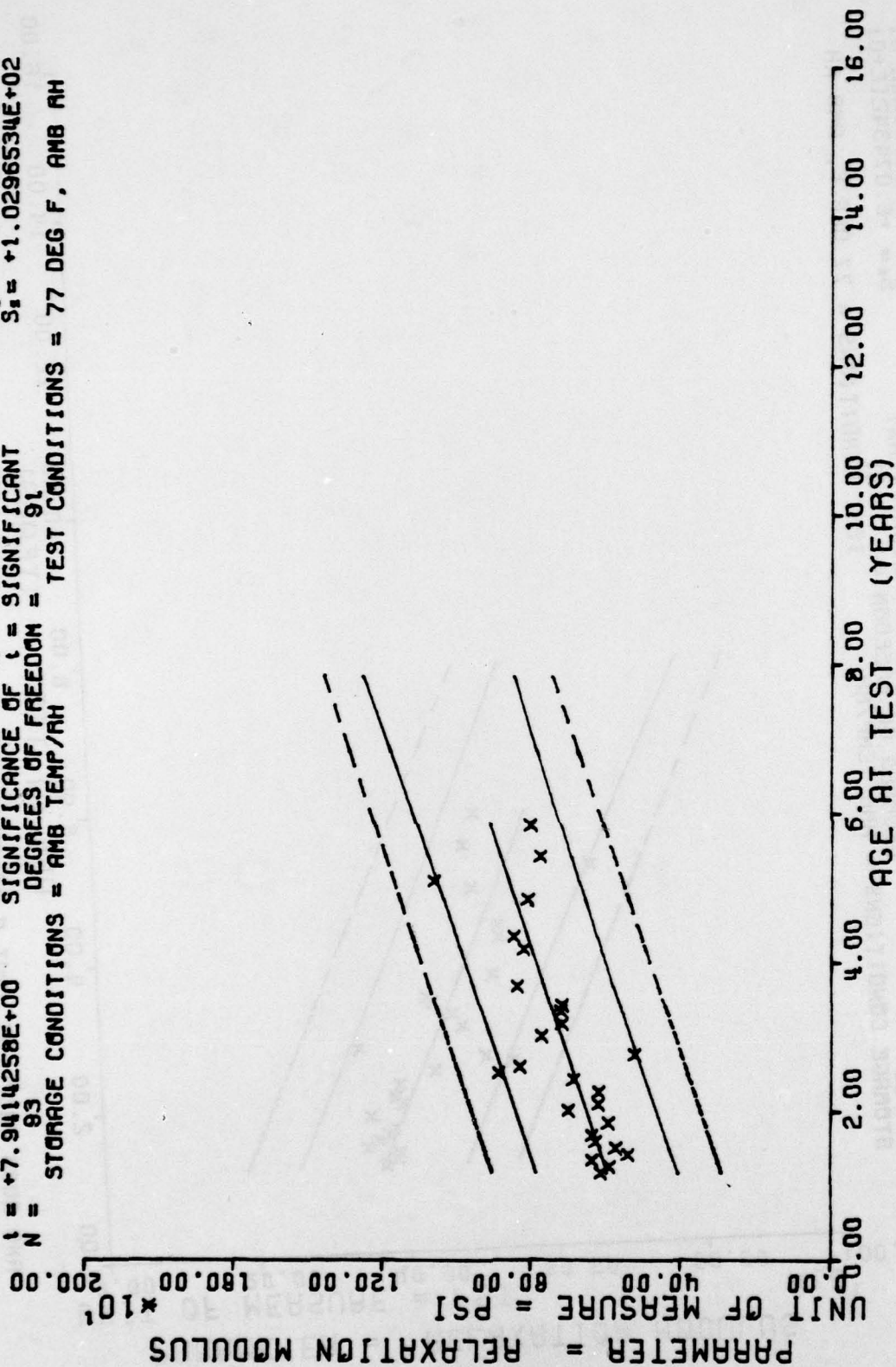


Figure 6-25

$Y = ((+3.1861384E+02) + (+3.7440615E+00) \times X)$   
 $F = +7.8851501E+01$  SIGNIFICANCE OF F = SIGNIFICANT  $G = +8.2535356E+01$   
 $R = +6.8135004E-01$  SIGNIFICANCE OF R = SIGNIFICANT  $S_0 = +4.2163629E-01$   
 $I = +8.8798368E+00$  SIGNIFICANCE OF I = SIGNIFICANT  $S_1 = +6.0743421E+01$   
 $N = 93$  DEGREES OF FREEDOM = 91  
 STORAGE CONDITIONS = AMB TEMP/AH TEST CONDITIONS = 77 DEG F, AMB RH

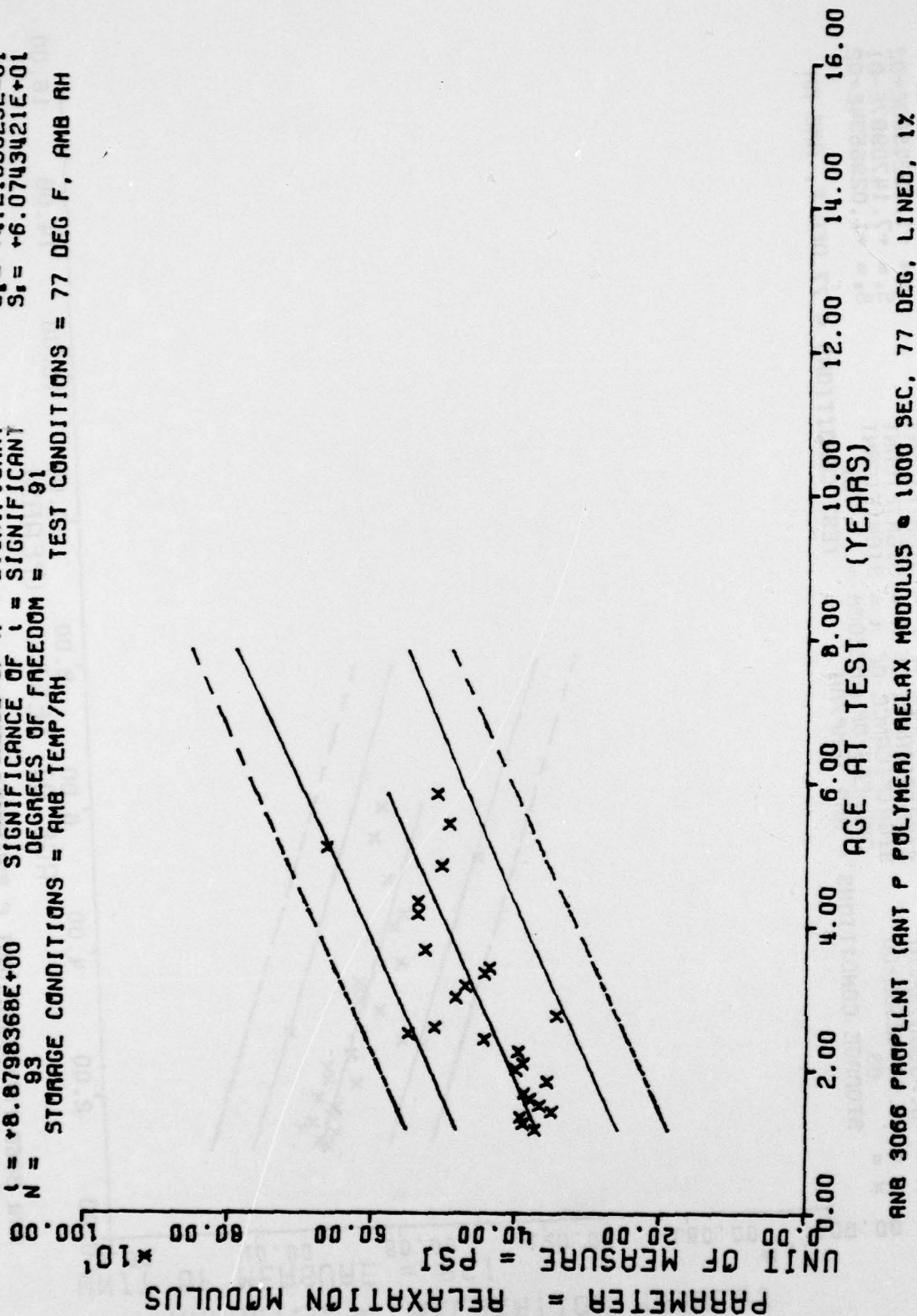


Figure 6-26

\*\*\* SAMPLE SIZE SUMMARY \*\*\*

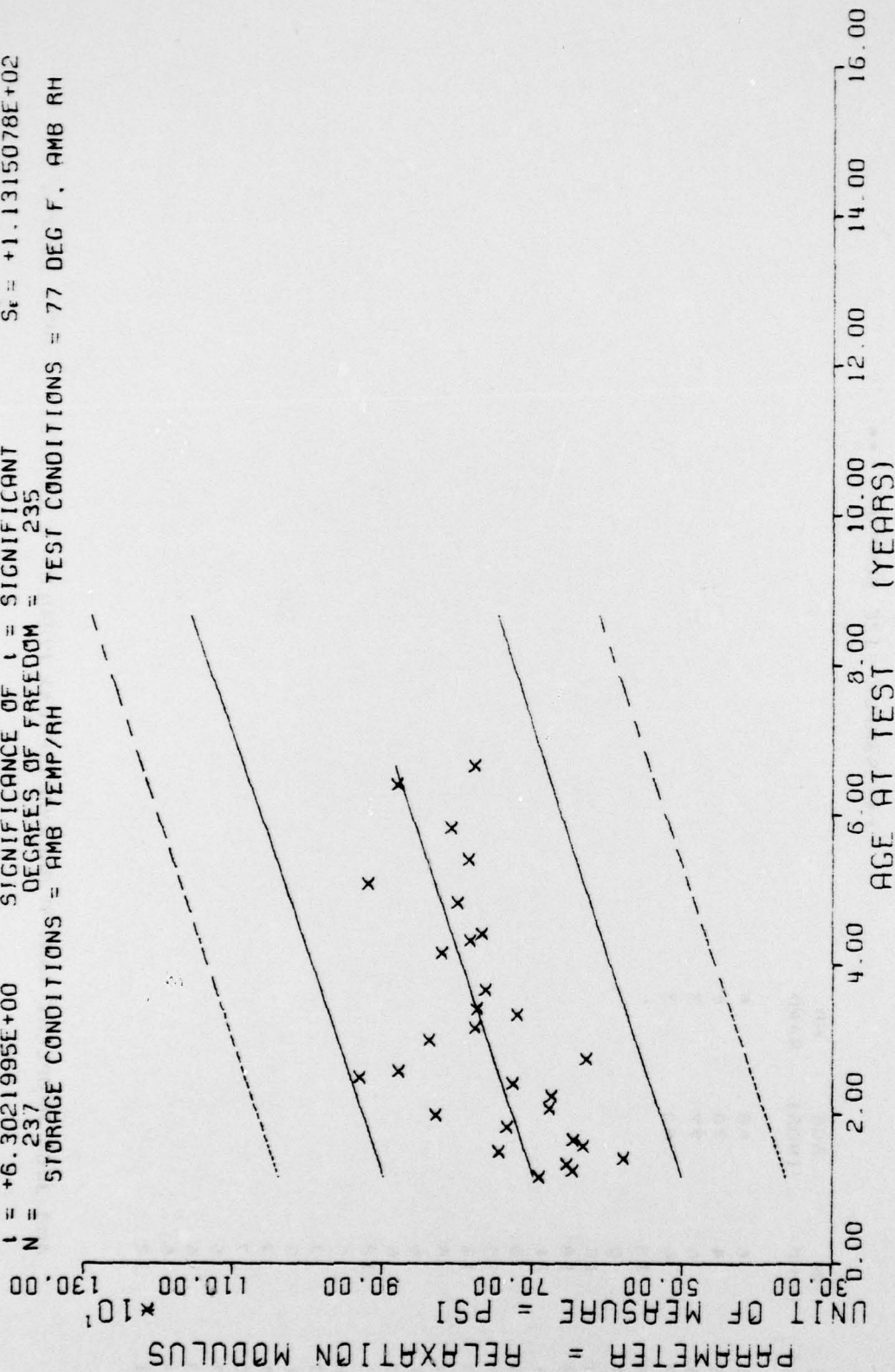
AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP
14	6	65	6
15	4	70	6
16	6	77	3
17	6	80	3
18	15		
19	6		
20	12		
22	18		
24	21		
25	6		
27	19		
29	14		
30	6		
31	6		
33	6		
36	12		
38	6		
40	3		
41	6		
44	9		
50	3		
52	6		
53	6		
59	6		
61	12		

AND 3066 PROPPLNT (ANT P POLYMER) RELAX MODULUS @ 10 SEC. 77 DEG. LINEO. 3%

This sample size summary is applicable to figures 6-27 and 6-28



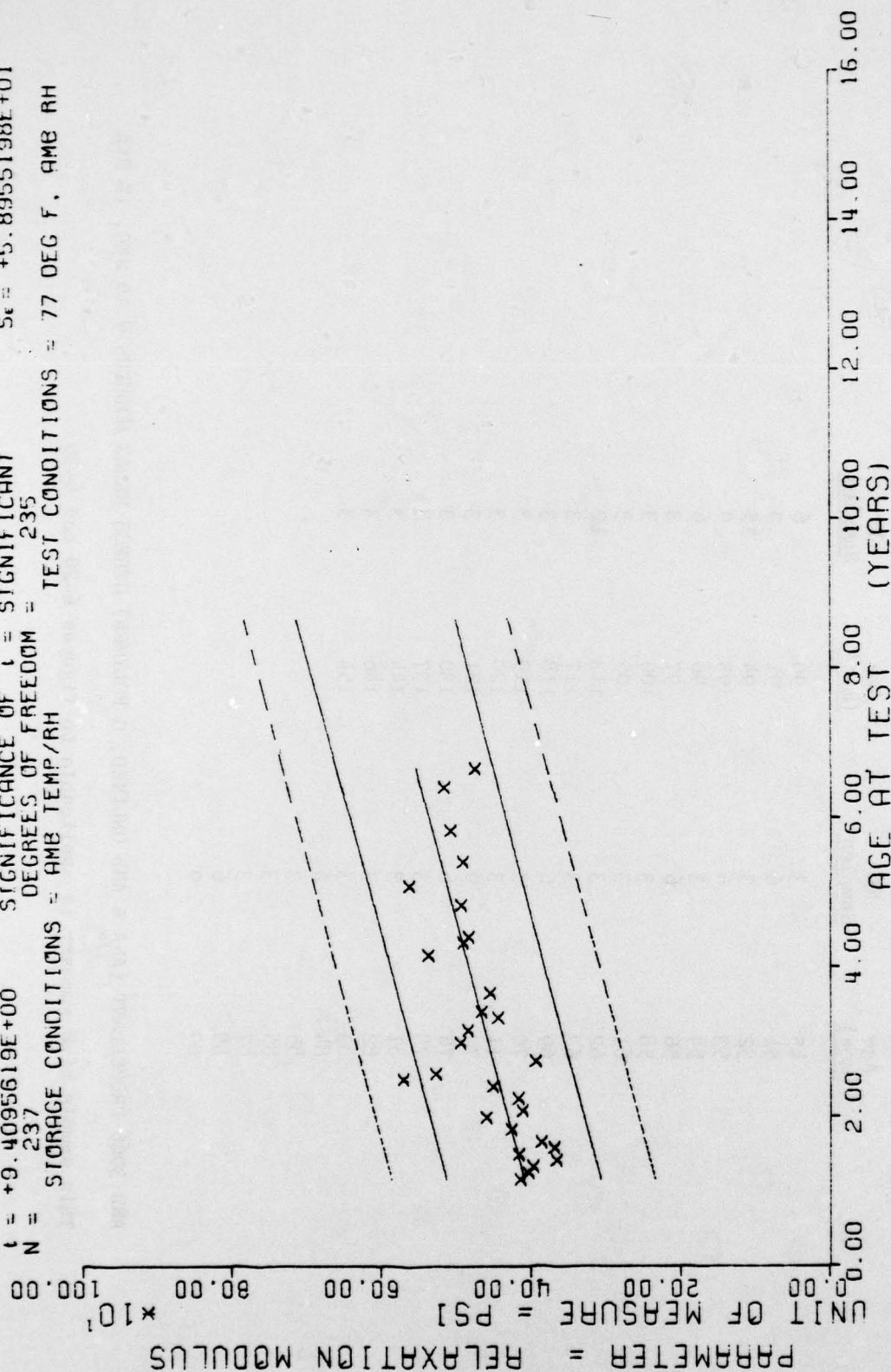
$F = +3.9717718E+01$  SIGNIFICANCE OF  $F =$  SIGNIFICANT  $S_e = +1.2208010E+02$   
 $R = +3.8023213E-01$  SIGNIFICANCE OF  $R =$  SIGNIFICANT  $S_b = +4.4180393E-01$   
 $t = +6.3021995E+00$  SIGNIFICANCE OF  $t =$  SIGNIFICANT  $S_c = +1.1315078E+02$   
 $N = 237$  DEGREES OF FREEDOM = 235  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 77 DEG F, AMB RH



ANB 3066 PROPELLANT (ANT P POLYMER) RELAX MODULUS @ 10 SEC. 77 DEG. LINED, 32

Figure 6-27

Y = ( ( +3.7985226E+02 ) + ( +2.1660253E+00 ) \* X )  
 F = +8.8539857E+01 SIGNIFICANCE OF F = SIGNIFICANT  $\sigma = +6.9028748E+01$   
 R = +5.2312504E-01 SIGNIFICANCE OF R = SIGNIFICANT  $S_e = +2.3019406E-01$   
 t = +9.4095619E+00 SIGNIFICANCE OF t = SIGNIFICANT  $S_e = +5.8955198E+01$   
 N = 237 DEGREES OF FREEDOM = 235  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 77 DEG F, AMB RH



AMB 3066 PROPLNT (ANT P POLYMER) RELAX MODULUS @ 1000 SEC. 77 DEG. LINED. 3%

Figure 6-28

# SAMPLE SIZE SUMMARY

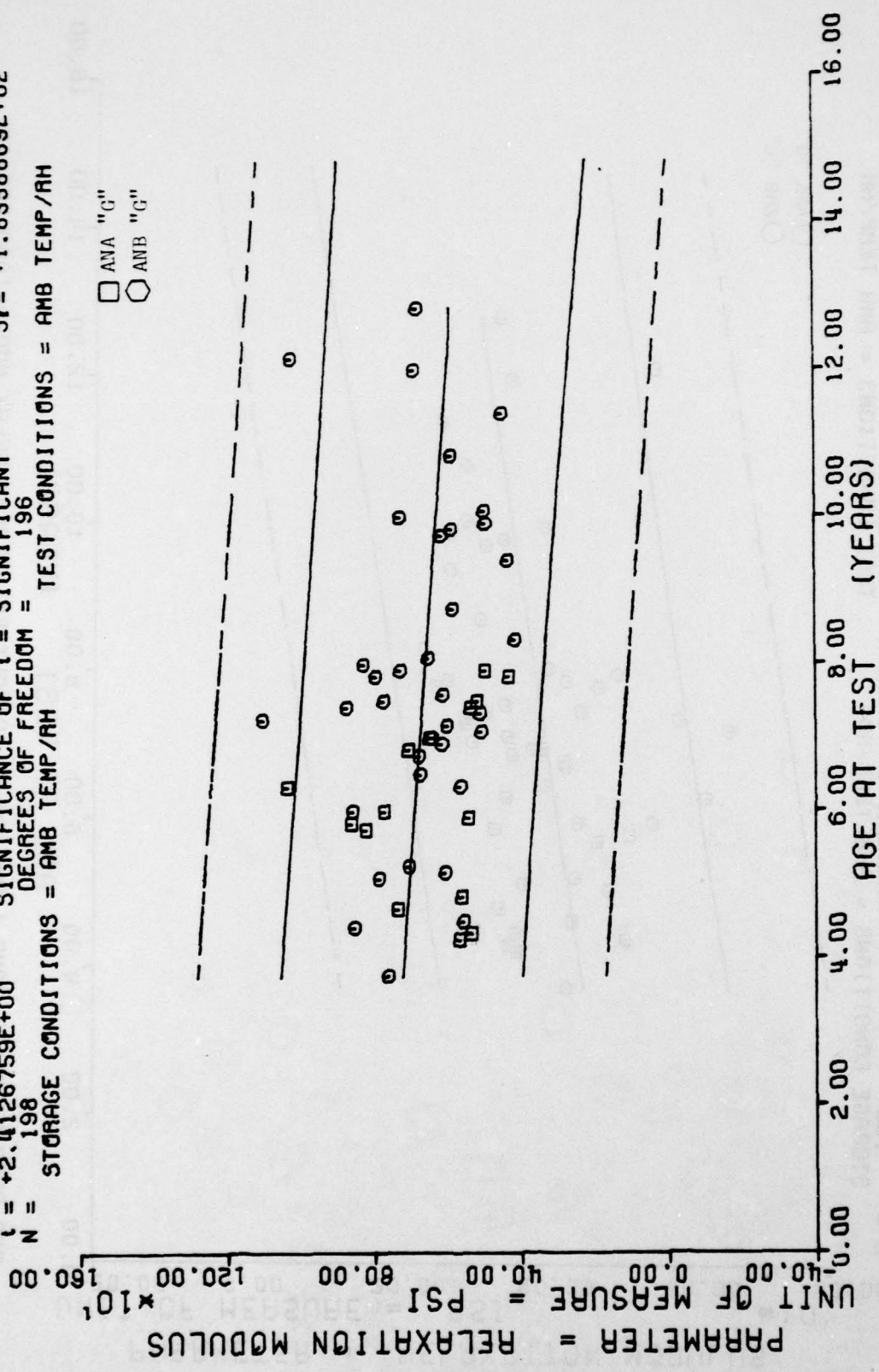
<u>Age (mos)</u>	<u>Nr Samples</u>	<u>Age (mos)</u>	<u>Nr Samples</u>
45	3	90	6
51	6	91	3
52	3	94	15
53	6	95	9
54	3	96	6
56	6	97	3
58	3	100	3
61	3	105	3
62	3	113	12
63	3	117	3
69	6	118	3
70	3	119	3
71	3	120	3
72	9	121	3
76	6	130	3
78	3	137	3
81	3	144	3
82	3	146	3
83	3	154	3
84	6		3
85	3		3
86	3		3
87	3		3
88	6		3
89	9		3

ANB 3066 PROPELLANT (ANA & ANB UNLINED, G POLYMER) STRESS RELAX MODULUS @ 10 SEC, 1% Stn

This sample size summary is applicable to figures 6-29 and 6-30



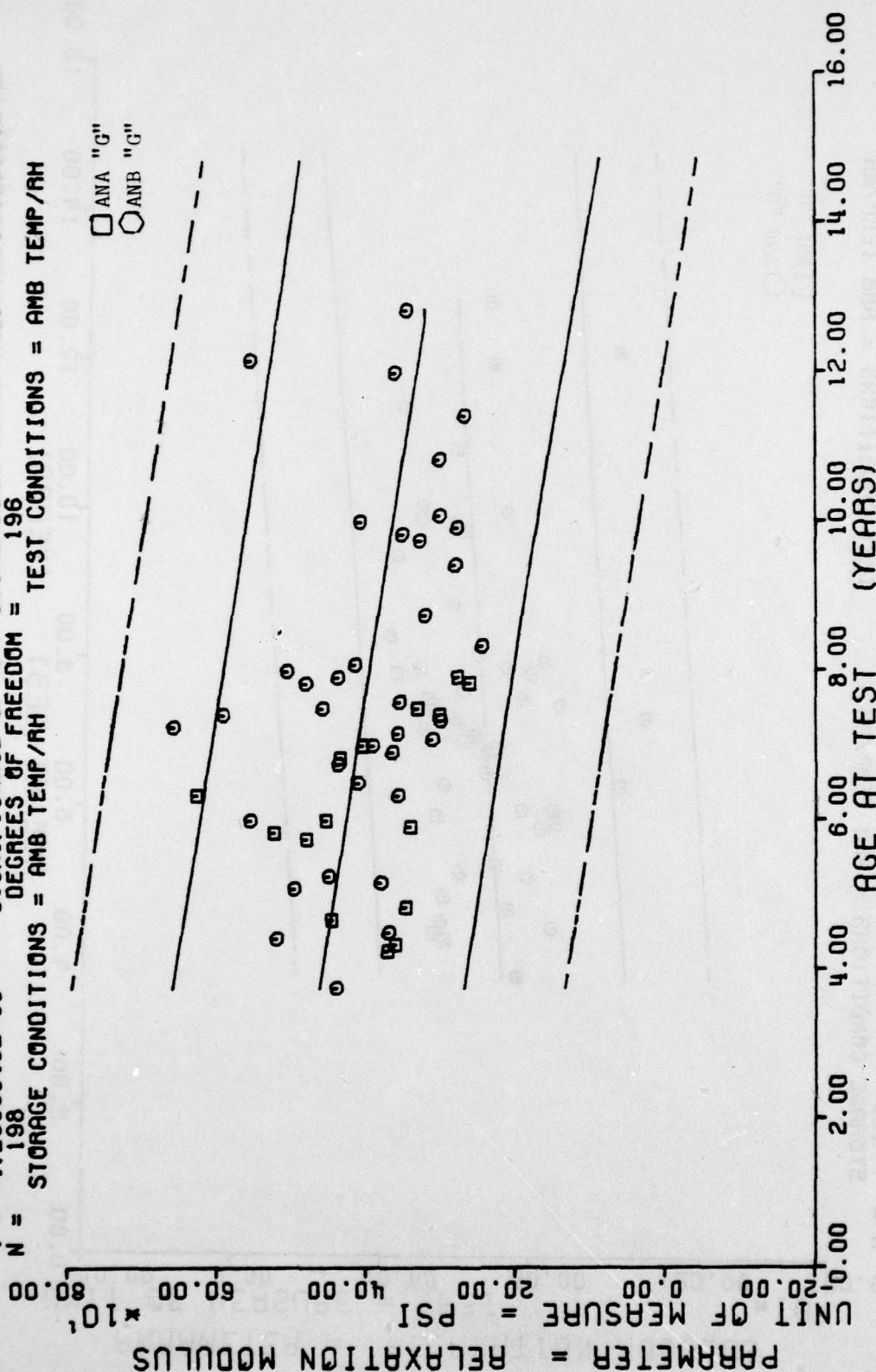
$Y = ((+7.8004298E+02) + (-1.2857026E+00) * X)$   
 $F = +5.8210050E+00$  SIGNIFICANCE OF F = SIGNIFICANT  
 $R = -1.6983054E-01$  SIGNIFICANCE OF R = SIGNIFICANT  
 $t = +2.4126759E+00$  SIGNIFICANCE OF t = SIGNIFICANT  
 $N = 198$  DEGREES OF FREEDOM = 196  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH



ANB 3066 PROPLINT (ANA & ANB UNLND, G POLYMER) STRESS RELAX MODULUS @ 10 SEC 1X

Figure 6-29

$Y = ((+5.2346749E+02) + (-1.3318797E+00) \times X)$   
 $F = +1.7682315E+01$  SIGNIFICANCE OF F = SIGNIFICANT  
 $R = -2.8766384E-01$  SIGNIFICANCE OF R = SIGNIFICANT  
 $t = +4.2050345E+00$  SIGNIFICANCE OF t = SIGNIFICANT  
 $N = 198$  DEGREES OF FREEDOM = 196  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH



ANB 3066 PROPLNT (ANA & ANB UNLND, G POLYMER) STRESS RELAX MOD @ 1000 SEC 1%

Figure 6-30

\*\*\* SAMPLE SIZE SUMMARY \*\*\*

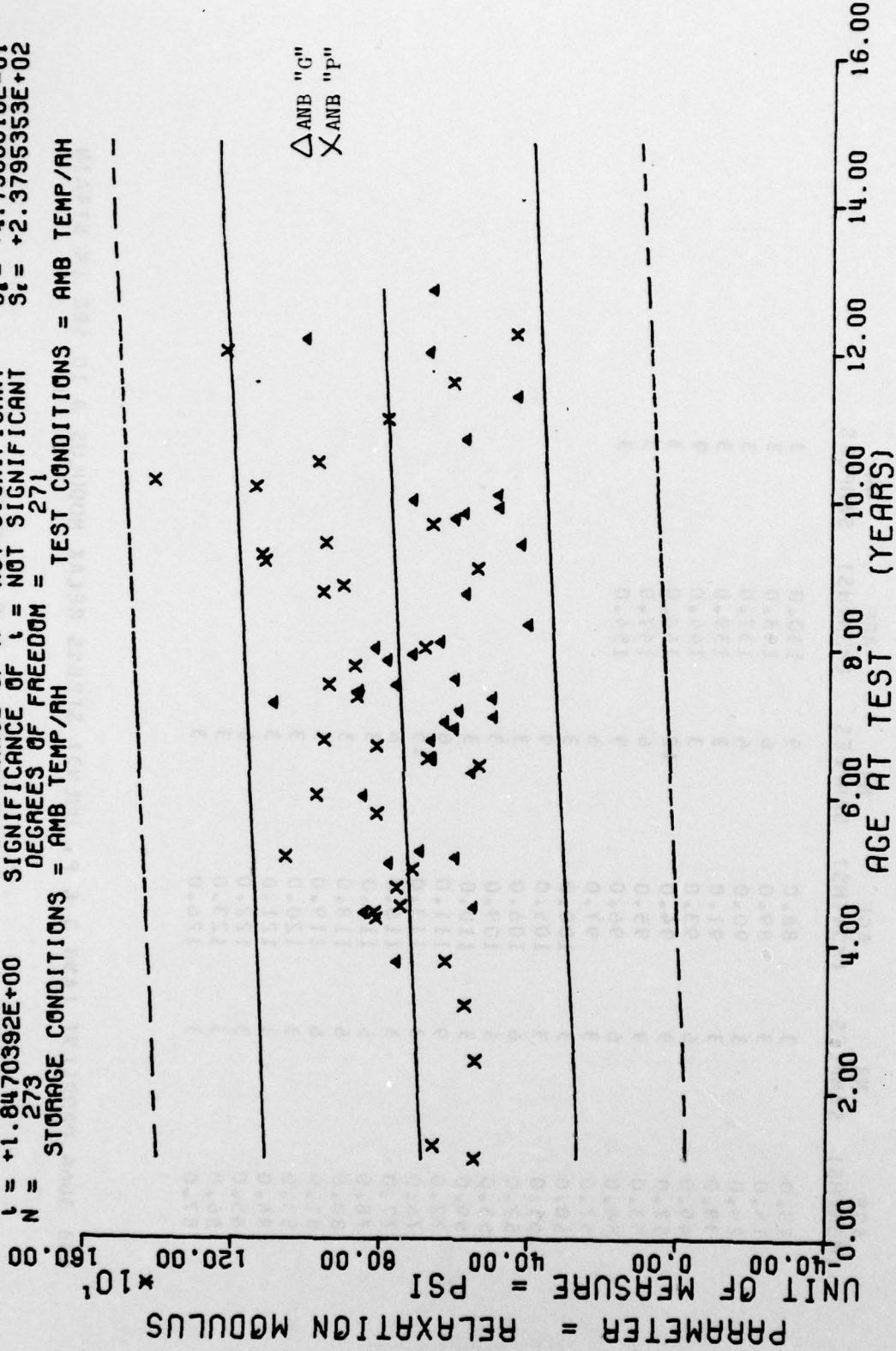
AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES
13.0	3	88.0	9	130.0	3
15.0	3	89.0	6	133.0	3
29.0	3	90.0	6	137.0	3
38.0	3	91.0	3	139.0	3
45.0	6	93.0	3	144.0	9
52.0	9	94.0	12	146.0	3
53.0	9	95.0	6	147.0	3
54.0	6	96.0	9	154.0	3
57.0	3	97.0	3		
50.0	3	100.0	3		
61.0	3	105.0	9		
52.0	6	106.0	3		
53.0	3	109.0	3		
69.0	3	110.0	3		
72.0	9	111.0	6		
76.0	3	113.0	15		
77.0	3	116.0	6		
78.0	5	117.0	3		
80.0	6	118.0	3		
81.0	6	119.0	3		
83.0	3	120.0	3		
84.0	3	121.0	3		
85.0	3	122.0	6		
86.0	3	123.0	3		
87.0	3	126.0	3		

AVR 3066 PROPLLVT (ANB G & P, UNLND) STRESS RELAX MODULUS @ 10 SEC 1% STRAIN

This sample size summary is applicable to figures 6-31 and 6-32



$Y = ((+6.7614878E+02) + (+8.7857409E-01) \times X)$   
 SIGNIFICANCE OF F = NOT SIGNIFICANT  
 SIGNIFICANCE OF R = NOT SIGNIFICANT  
 SIGNIFICANCE OF t = NOT SIGNIFICANT  
 DEGREES OF FREEDOM = 271  
 STORAGE CONDITIONS = AMB TEMP/AH  
 TEST CONDITIONS = AMB TEMP/AH  
 $F = +3.4115538E+00$   
 $R = +1.1150001E-01$   
 $t = +1.8470392E+00$   
 $N = 273$   
 $S_e = +2.3900605E+02$   
 $S_b = +4.7566618E-01$   
 $S_t = +2.3795353E+02$

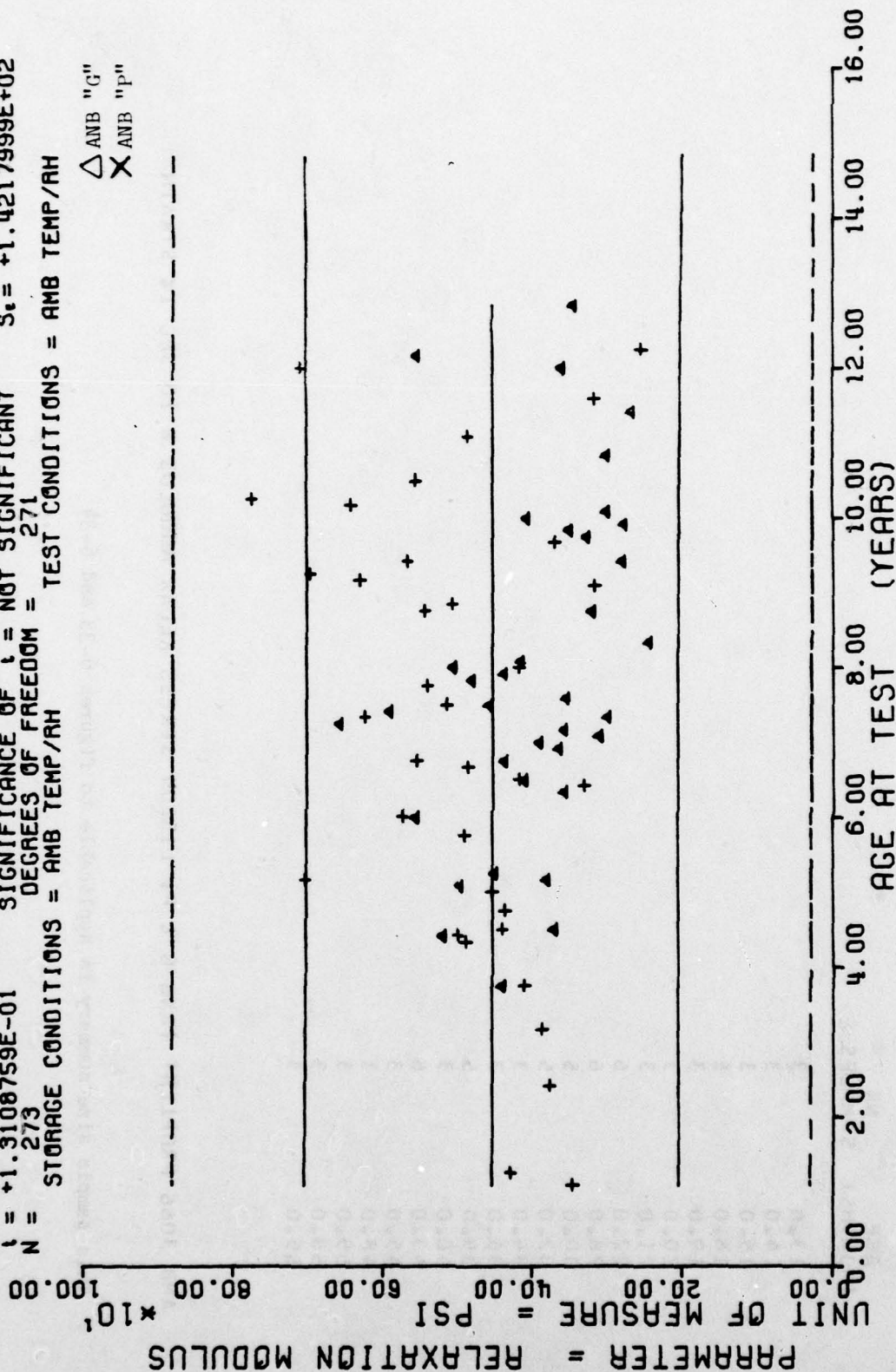


ANB 3066 PROPLANT (ANB G & P, UNLND) STRESS RELAX MODULUS @ 10 SEC 1% STRAIN

Figure 6-31

$Y = ((+4.5652647E+02) + (-3.7257199E-02) \times X)$   
 $F = +1.7183957E-02$  SIGNIFICANCE OF F = NOT SIGNIFICANT  $S_e = +1.4192289E+02$   
 $R = -7.9627518E-03$  SIGNIFICANCE OF R = NOT SIGNIFICANT  $S_o = +2.8421606E-01$   
 $t = +1.3108759E-01$  SIGNIFICANCE OF t = NOT SIGNIFICANT  $S_t = +1.4217999E+02$   
 $N = 273$  DEGREES OF FREEDOM = 271  
 STORAGE CONDITIONS = AMB TEMP/ RH TEST CONDITIONS = AMB TEMP/ RH

$\Delta$  ANB "G"  
 $\times$  ANB "P"



ANB 3066 PROPLANT (ANB G & P POLYMER, UNLND) STRESS RELAX MOD @ 1000 SEC, 1% ST

Figure 6-32

\*\*\* SAMPLE SIZE SUMMARY \*\*\*

AGE (MONTHS)	NR SAMPLES
13.0	3
14.0	3
15.0	3
16.0	6
19.0	3
20.0	3
21.0	3
22.0	6
28.0	6
30.0	5
32.0	5
34.0	3
36.0	3
39.0	5
40.0	3
43.0	6
45.0	3
48.0	3
55.0	3
58.0	3
55.0	3

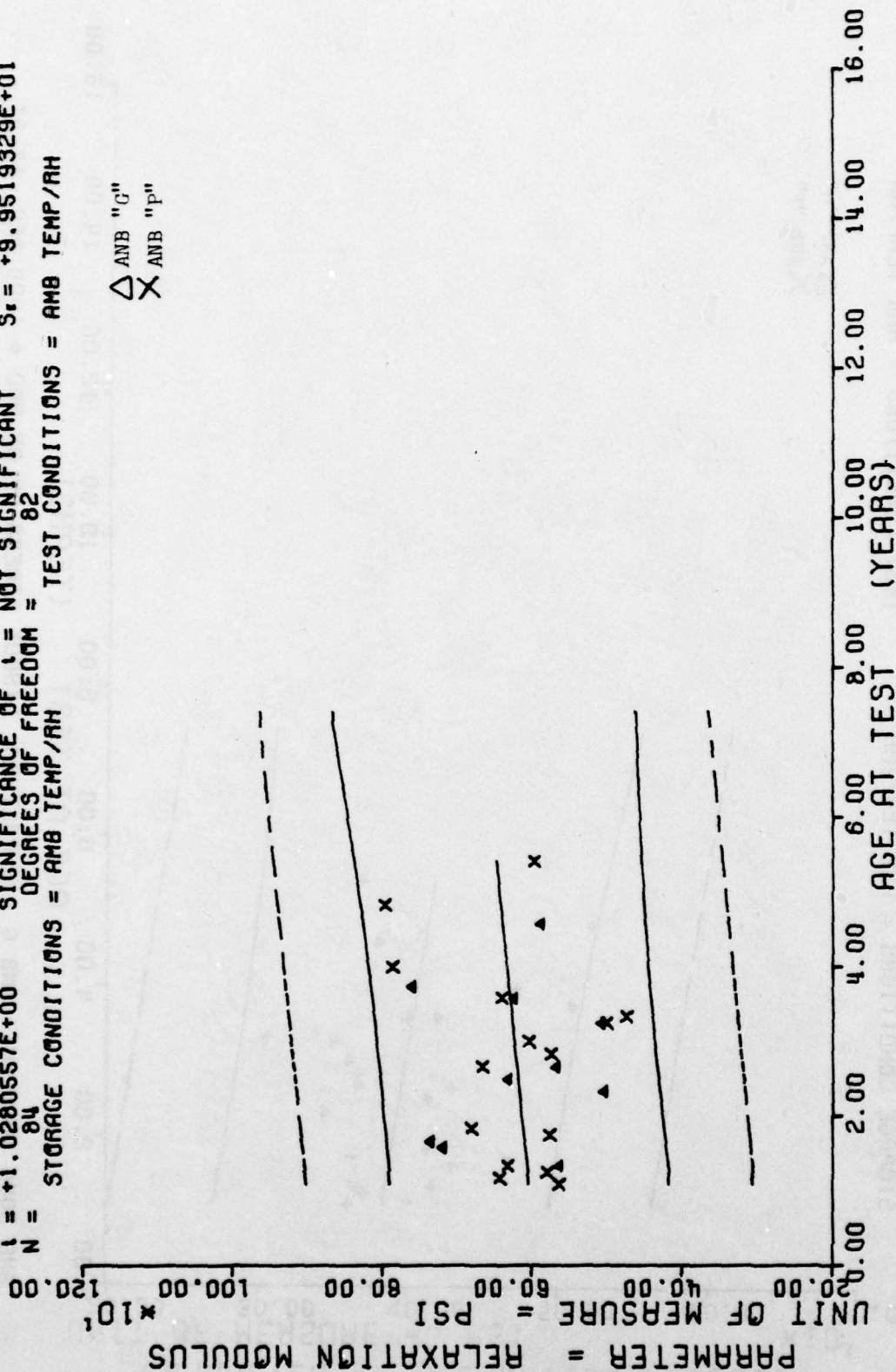
ANB 3066 PROPLANT (ANB G & P, LINED) STRESS RELAX MODULUS @ 10 SEC 1% STRAIN

This sample size summary is applicable to figures 6-33 and 6-34



$Y = ((+5.9276457E+02) + (+8.1128664E-01) \times X)$   
 $F = +1.0568985E+00$  SIGNIFICANCE OF F = NOT SIGNIFICANT  $\sigma = +9.9553434E+01$   
 $R = +1.1280511E-01$  SIGNIFICANCE OF R = NOT SIGNIFICANT  $S_e = +7.8914656E-01$   
 $t = +1.0280557E+00$  SIGNIFICANCE OF t = NOT SIGNIFICANT  $S_t = +9.9519329E+01$   
 $N = 84$  DEGREES OF FREEDOM = 82  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH

$\Delta$  ANB "G"  
 $\times$  ANB "P"

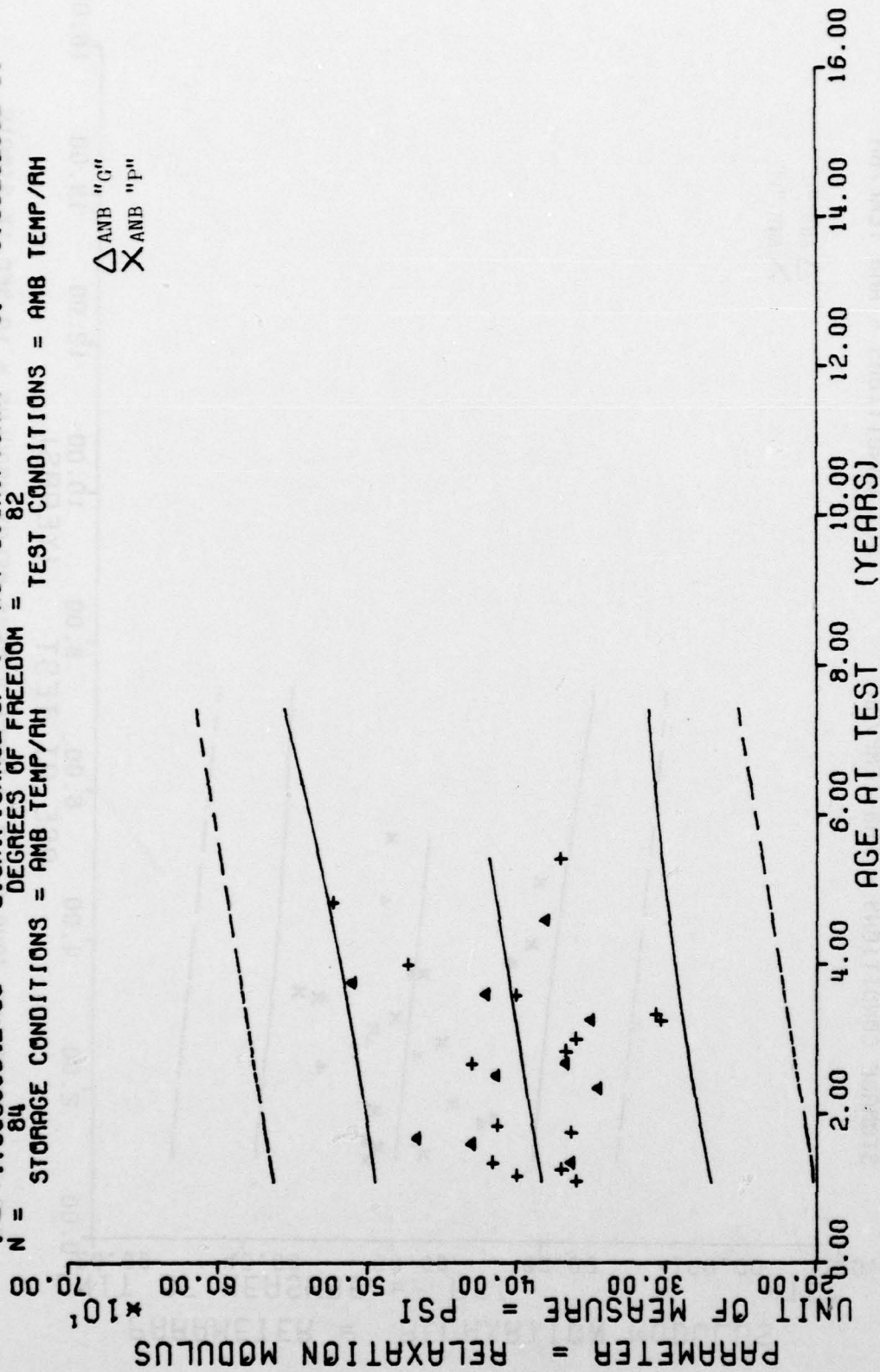


ANB 3066 PROPELLANT (ANB G & P, LINED) STRESS RELAX MODULUS • 10 SEC 1% STRAIN

Figure 6-33

Y = (( +3.7397112E+02 ) + ( +6.682386E-01 ) \* X)  
 F = +1.9432260E+00 SIGNIFICANCE OF F = NOT SIGNIFICANT  $\sigma_r = +6.0667070E+01$   
 R = +1.5214890E-01 SIGNIFICANCE OF R = NOT SIGNIFICANT  $S_o = +4.7835406E-01$   
 t = +1.3939964E+00 SIGNIFICANCE OF t = NOT SIGNIFICANT  $S_e = +6.0325265E+01$   
 N = 84 DEGREES OF FREEDOM = 82  
 STORAGE CONDITIONS = AMB TEMP/AH TEST CONDITIONS = AMB TEMP/AH

$\Delta_{ANB}$  "G"  
 $X_{ANB}$  "P"



ANB 3066 PROPLANT (ANB G & P POLYMER, LINED) STRESS RELAX MOD @ 1000 SEC, 1% ST

Figure 6-34

\*\*\* SAMPLE SIZE SUMMARY \*\*\*

AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES
13.0	6	64.0	6	126.0	3
15.0	6	66.0	3	133.0	3
16.0	3	69.0	3	139.0	3
29.0	3	70.0	3	144.0	6
33.0	3	72.0	3	147.0	3
36.0	6	73.0	3		
37.0	6	74.0	3		
38.0	6	77.0	6		
40.0	3	78.0	3		
41.0	3	79.0	3		
43.0	3	80.0	6		
44.0	6	81.0	6		
45.0	3	88.0	3		
47.0	6	90.0	3		
48.0	6	93.0	3		
50.0	3	96.0	3		
51.0	3	105.0	6		
52.0	12	106.0	3		
53.0	9	109.0	3		
54.0	9	110.0	3		
56.0	3	111.0	6		
57.0	6	113.0	3		
59.0	3	116.0	6		
60.0	6	122.0	6		
62.0	3	123.0	3		

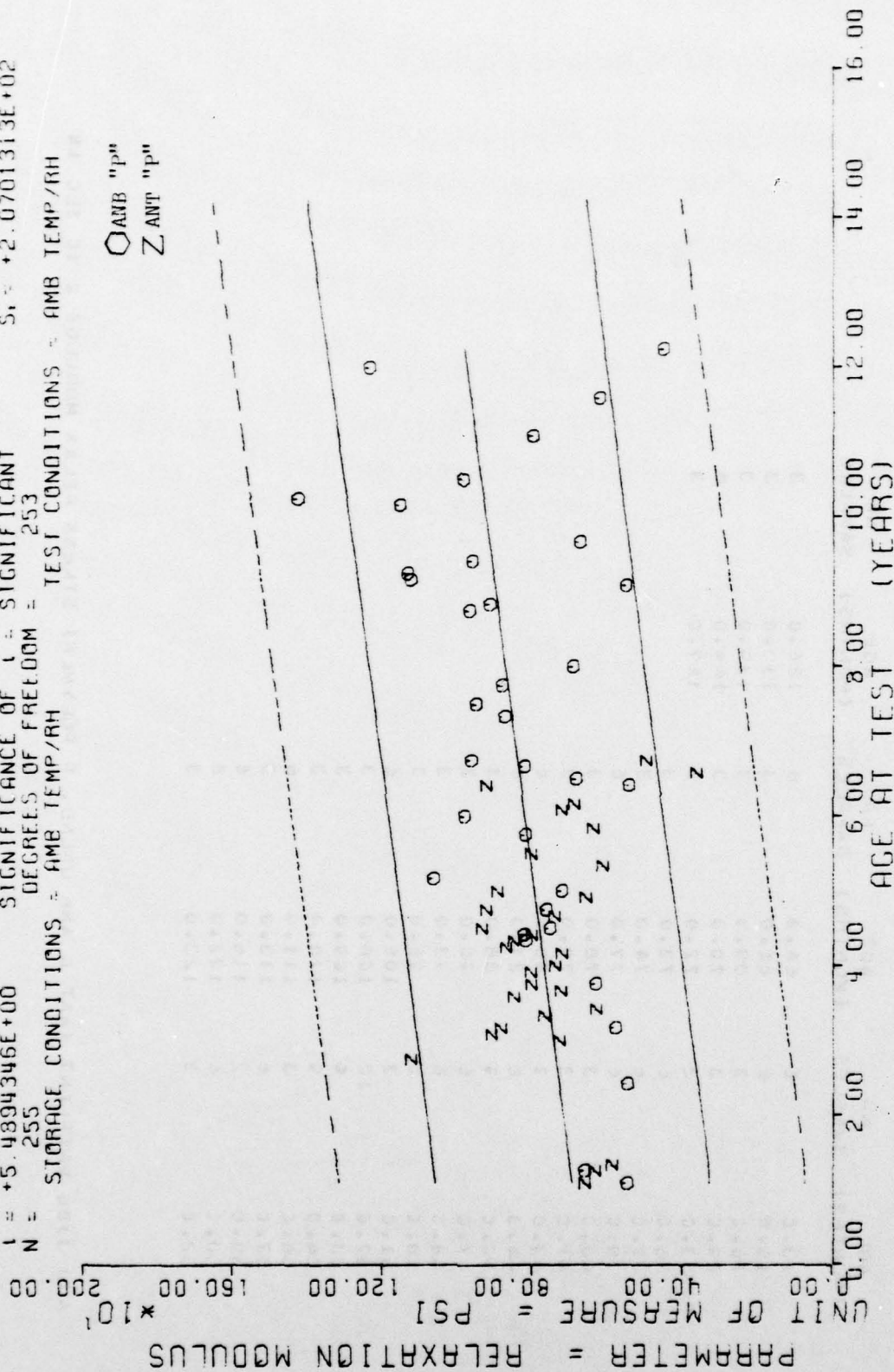
AD3 3J60 PROPLINT (ANT 8 AND UNLND. F POLYMER) STRESS RELAX MODULUS @ 10 SEC 1X

This sample size summary is applicable to figures 6-35 and 6-36



$\gamma = (1 + 6.6319971E+02) + ( +2.1310902E+00 ) \times X$   
 $F = +3.0133392E+01$  SIGNIFICANCE OF F = SIGNIFICANT  
 $R = +3.2623585E-01$  SIGNIFICANCE OF R = SIGNIFICANT  
 $t = +5.4394346E+00$  SIGNIFICANCE OF t = SIGNIFICANT  
 $N = 255$  DEGREES OF FREEDOM = 253  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH

O ANB "p"  
 Z ANT "p"



ANB 3065 PROPELLANT (ANT & ANB UNLND, P POLYMER) STRESS RELAX MODULUS @ 10 SEC 12

Figure 6-35

$Y = ((+4.2005519E+02) + (+8.9524027E-01) \times X)$   
 $F = +1.4161766E+01$  SIGNIFICANCE OF F = SIGNIFICANT  $G_1 = +1.3009927E+02$   
 $R = +2.3023511E-01$  SIGNIFICANCE OF R = SIGNIFICANT  $S_0 = +2.3789258E-01$   
 $t = +3.7632122E+00$  SIGNIFICANCE OF t = SIGNIFICANT  $S_1 = +1.2685411E+02$   
 $N = 255$  DEGREES OF FREEDOM = 253  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH

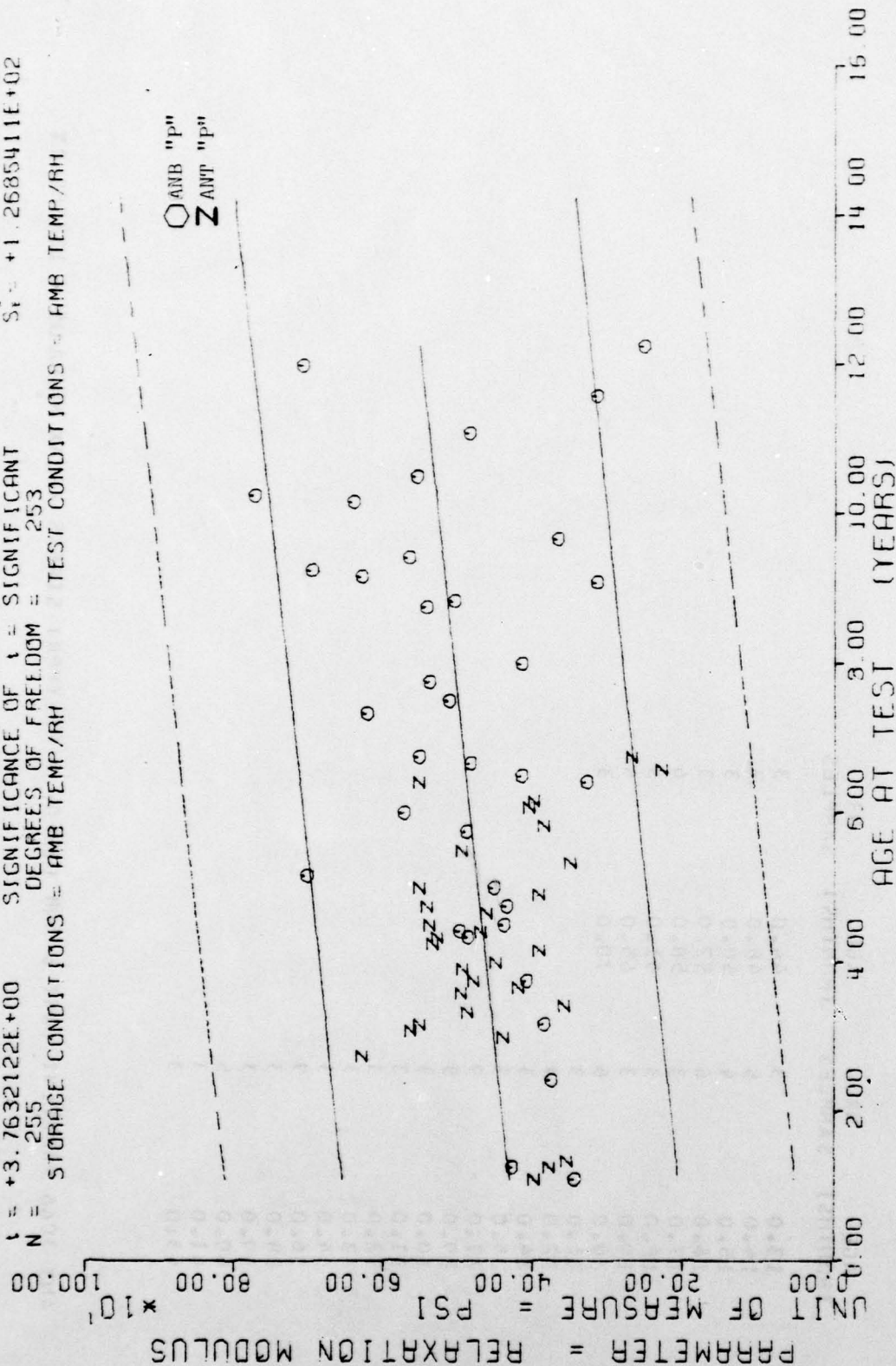


Figure 6-36

\*\*\* SAMPLE SIZE SUMMARY \*\*\*

AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES
13.0	3	44.0	3
14.0	5	48.0	3
15.0	4	50.0	3
16.0	6	52.0	3
17.0	3	58.0	6
18.0	3	61.0	3
19.0	3	65.0	5
20.0	6	70.0	3
21.0	3		
22.0	3		
24.0	3		
25.0	3		
27.0	3		
29.0	8		
30.0	3		
31.0	3		
32.0	3		
33.0	3		
34.0	3		
36.0	3		
38.0	3		
39.0	3		
40.0	5		
41.0	3		
43.0	3		

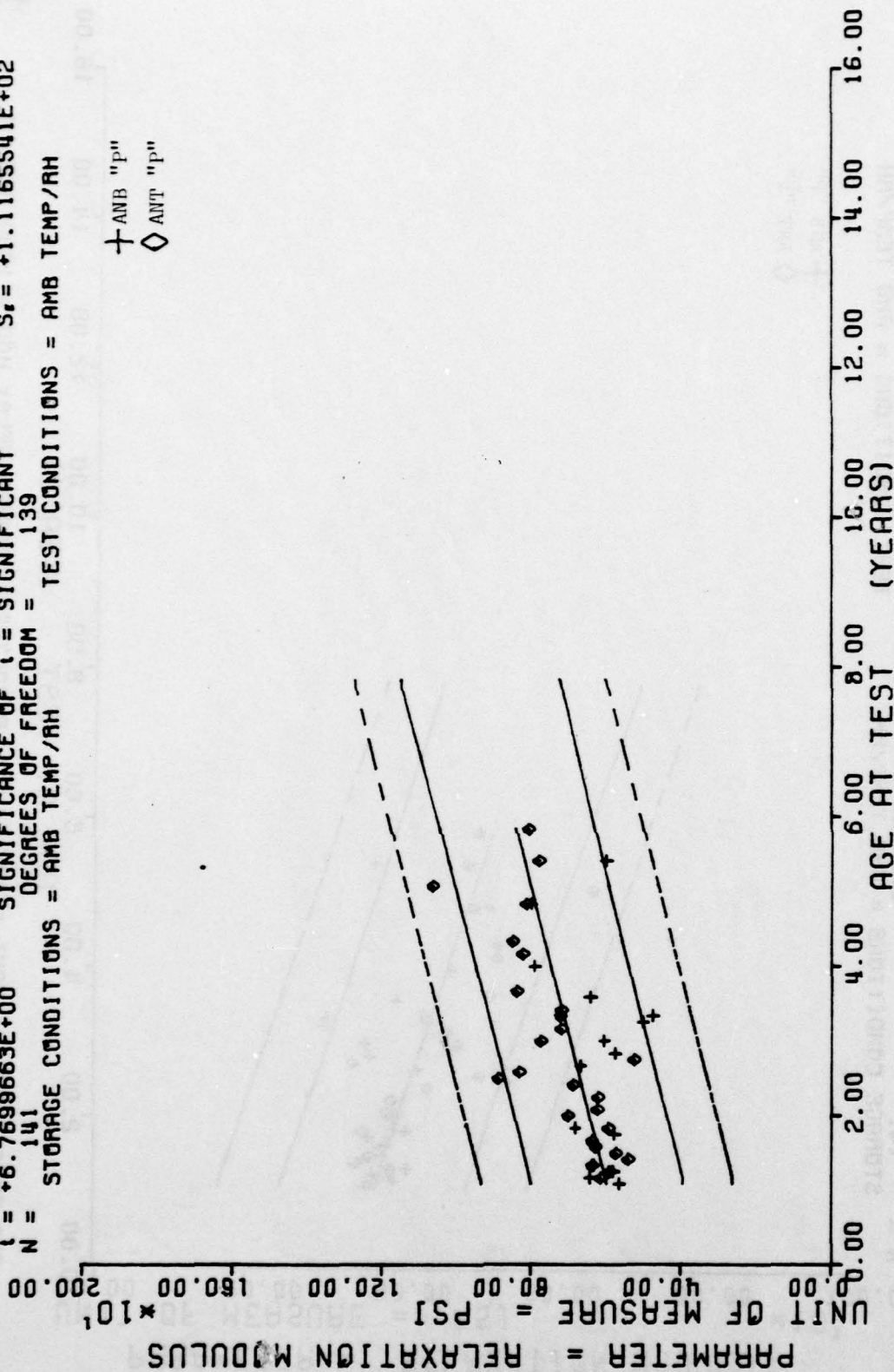
ANB 3066 PROPLLYT (ANT & ANB LINED, P POLYMER) STRESS RELAX MODULUS @ 10 SEC 18

This sample size summary is applicable to figures 6-37 and 6-38



$Y = ((+5.4001865E+02) + (+4.2073802E+00) * X)$   
 $F = +4.5832444E+01$  SIGNIFICANCE OF F = SIGNIFICANT  
 $R = +4.9796337E-01$  SIGNIFICANCE OF R = SIGNIFICANT  
 $t = +6.7699663E+00$  SIGNIFICANCE OF t = SIGNIFICANT  
 $N = 141$  DEGREES OF FREEDOM = 139  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH

+ ANB "P"  
 ◇ ANT "P"

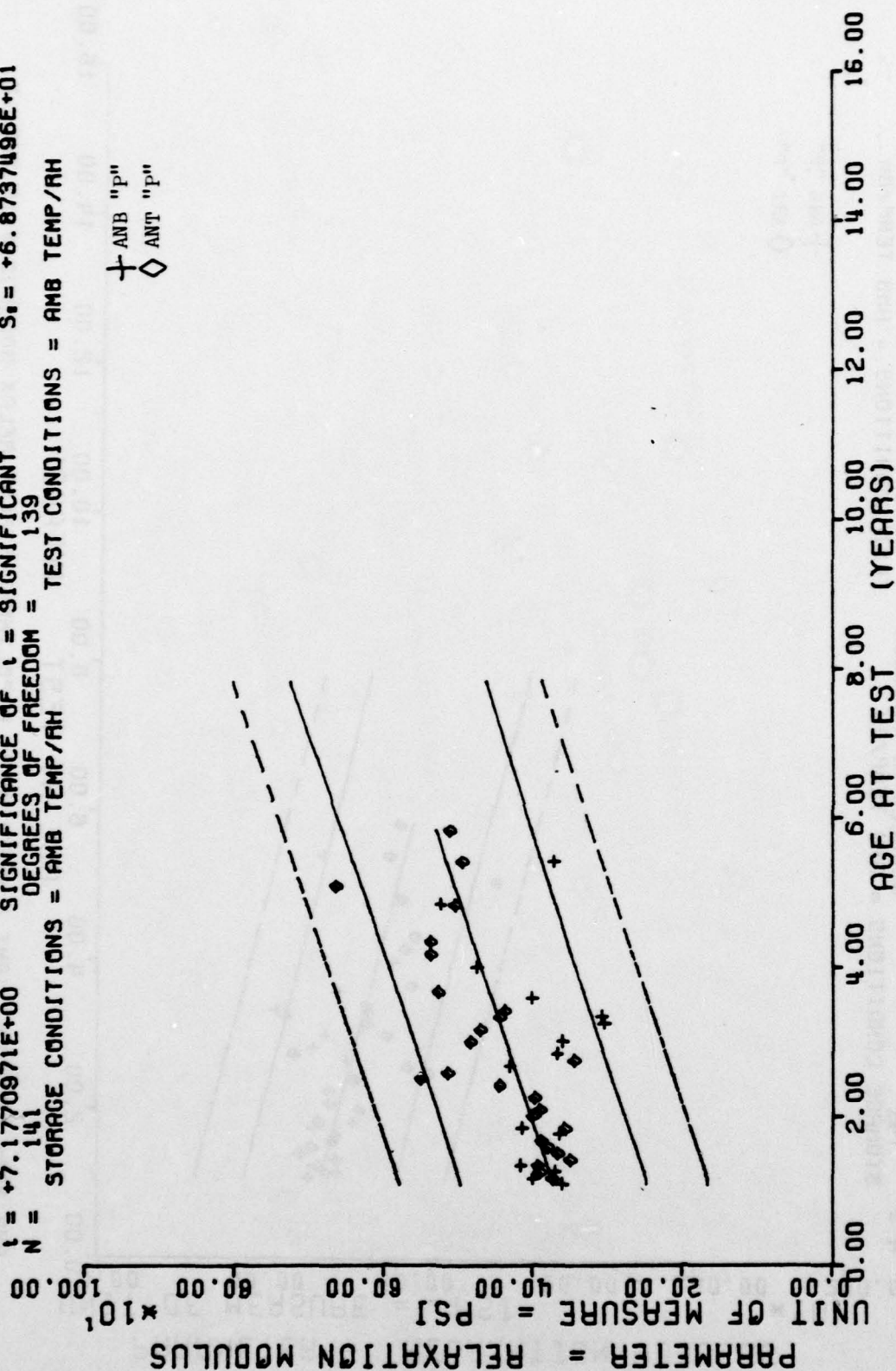


ANB 3066 PROPLINT (ANT & ANB LINED, P POLYMER) STRESS RELAX MODULUS • 10 SEC 1%

Figure 6-37

$Y = ((+3.3544757E+02) + (+2.7459206E+00) \times X)$   
 $F = +5.1510723E+01$  SIGNIFICANCE OF F = SIGNIFICANT  $\sigma_1 = +8.0184311E+01$   
 $R = +5.1998295E-01$  SIGNIFICANCE OF R = SIGNIFICANT  $S_0 = +3.8259488E-01$   
 $t = +7.1770971E+00$  SIGNIFICANCE OF t = SIGNIFICANT  $S_1 = +6.8737496E+01$   
 $N = 141$  DEGREES OF FREEDOM = 139  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH

+ ANB "P"  
 ◇ ANT "P"



ANB 3066 PROPLINT (ANT & ANB LINED, P POLYMER) STRESS RELAX MOD • 1000 SEC 1X

Figure 6-38

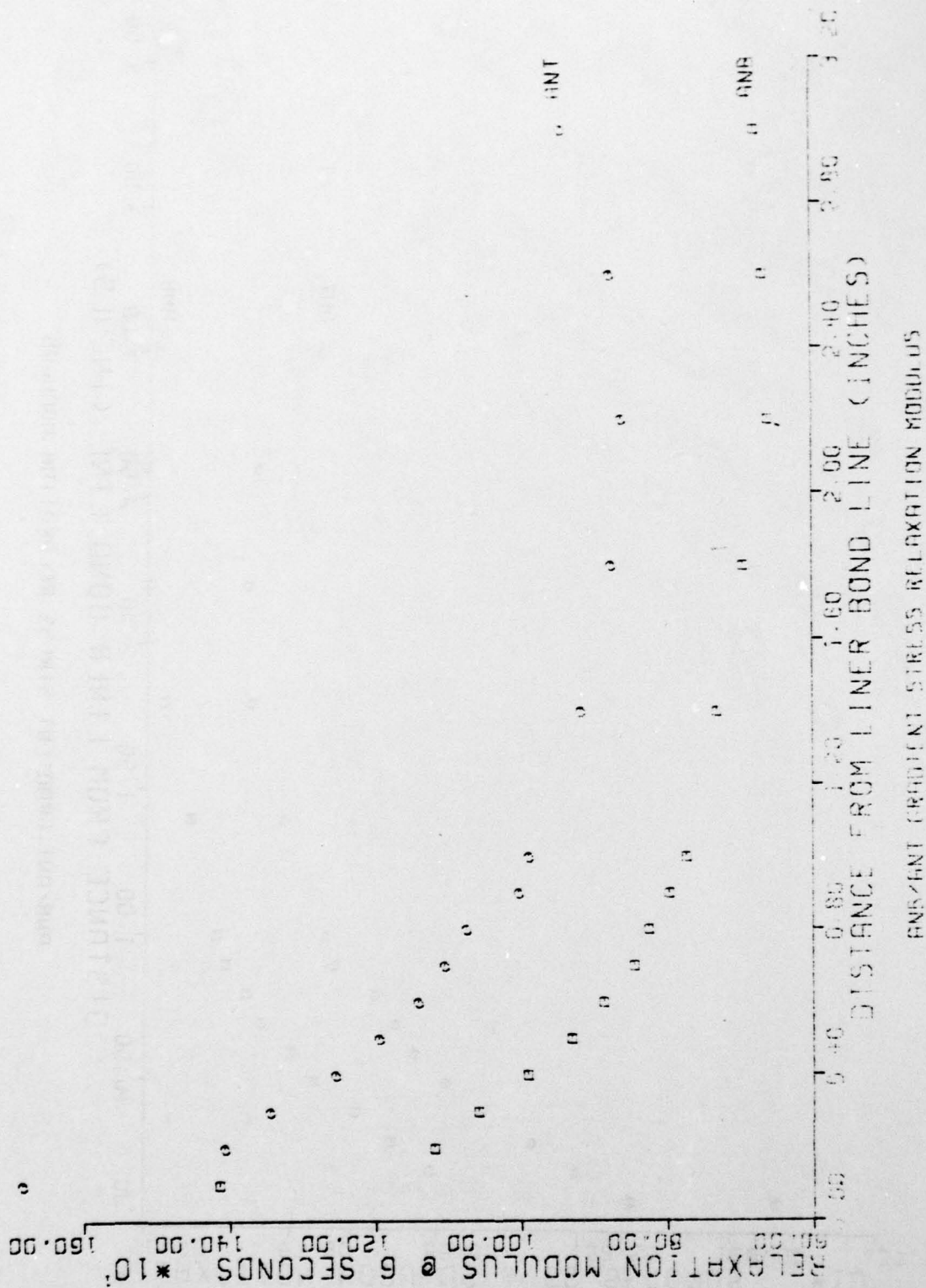


Figure 6-39



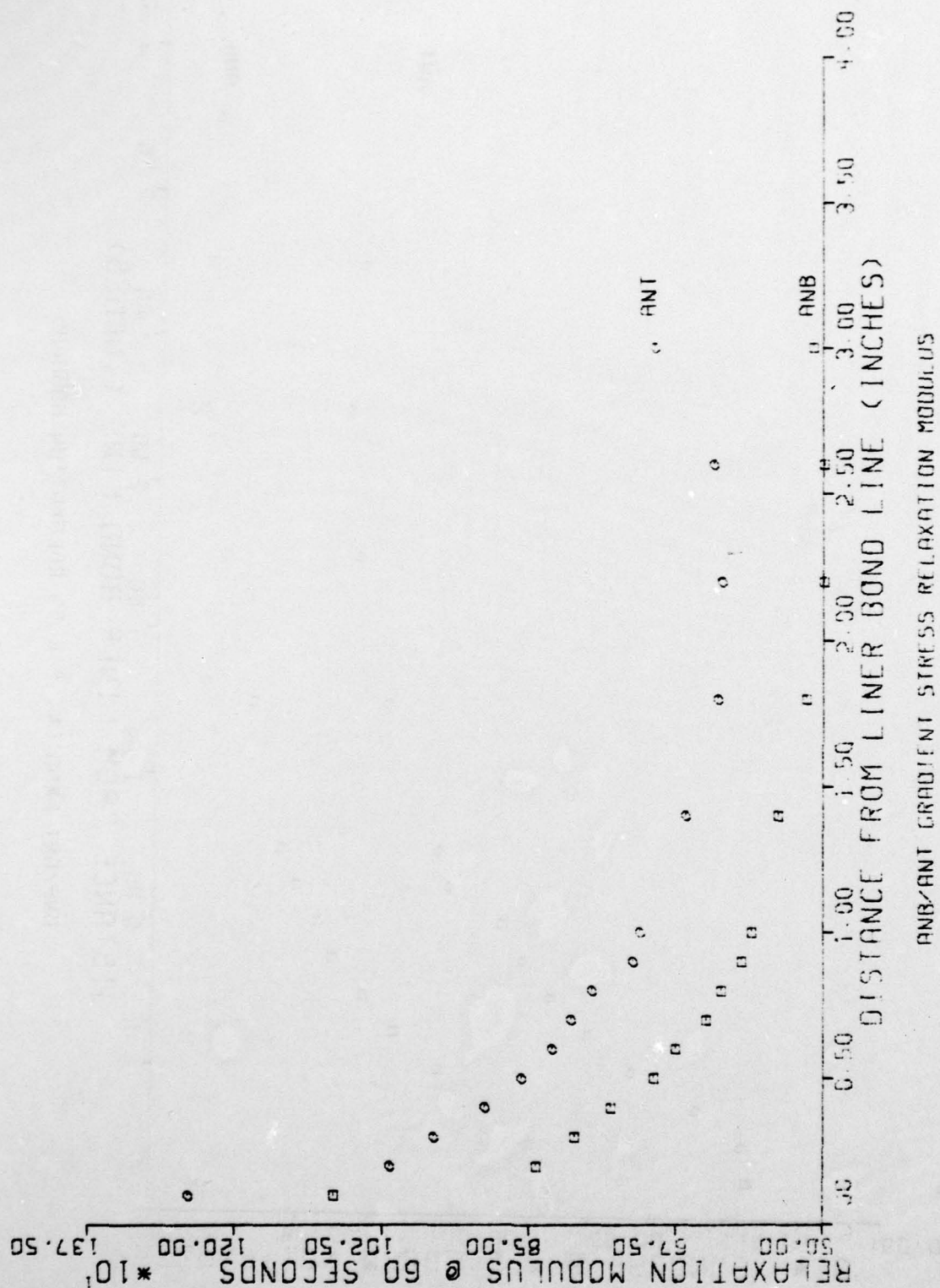


Figure 6-40

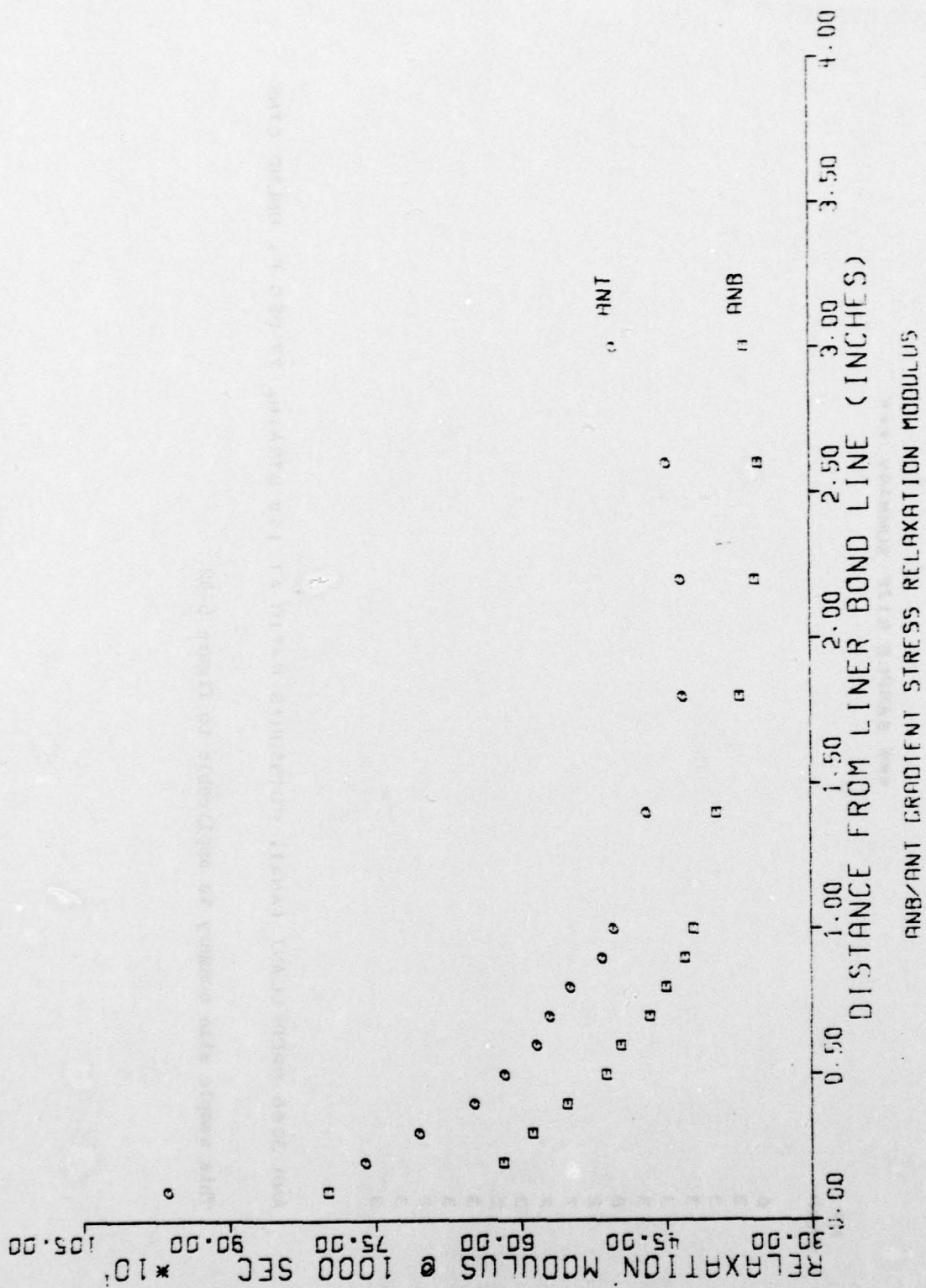


Figure 6-41

\*\*\* SAMPLE SIZE SUMMARY \*\*\*

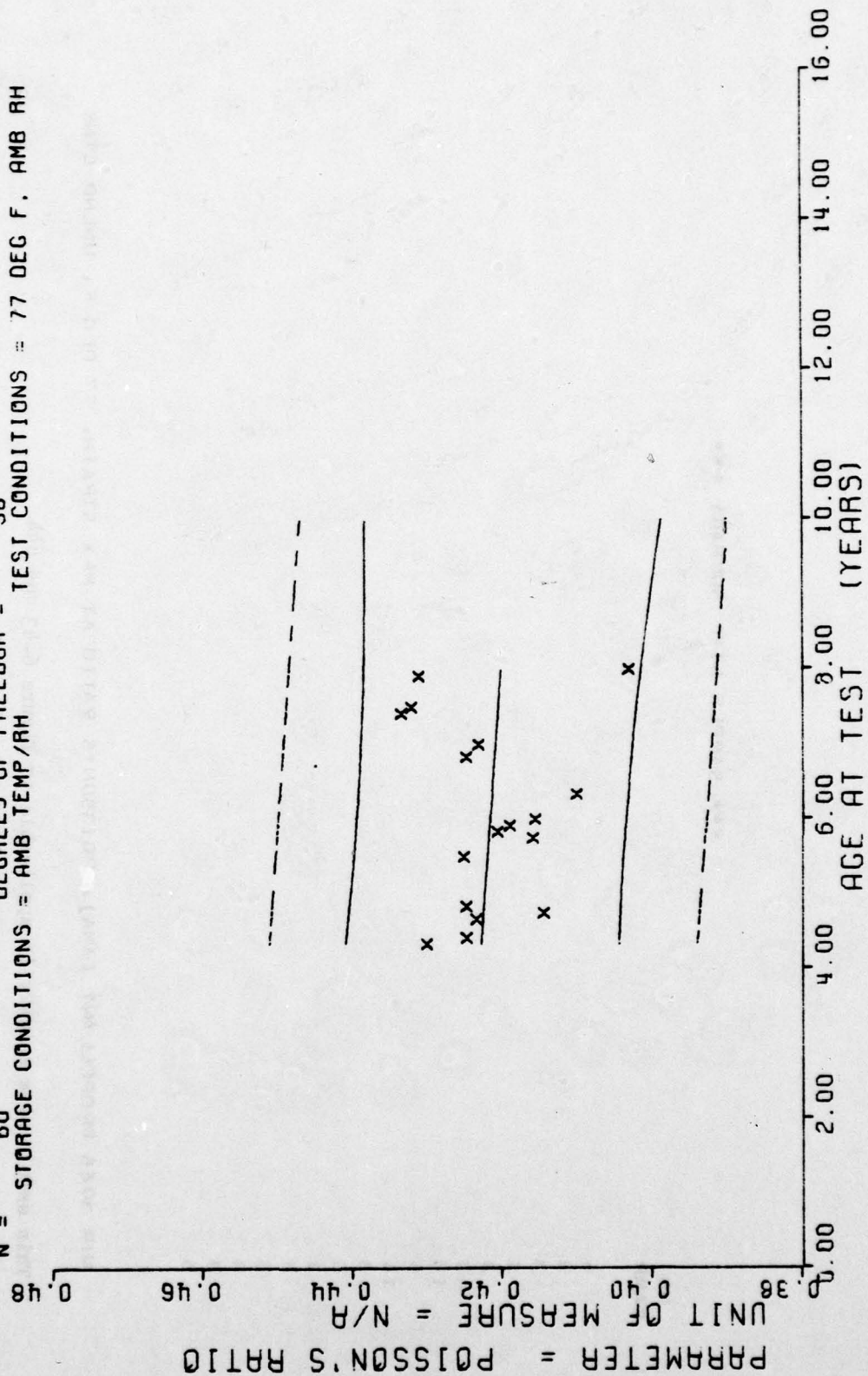
AGE (MOS)	NR SAMP
52	6
53	3
56	3
57	3
58	3
65	3
69	8
70	2
71	7
72	2
76	3
82	3
84	3
89	3
90	2
95	3
96	3

ANR 3066 PROPELLANT (ANA). POISSON'S RATIO AT 15% STRAIN, 77 DEG F. UNLND CTNS

This sample size summary is applicable to figure 6-42



Y = (( +4.2577073E-01 ) + ( -6.1310513E-05 ) \* X)  
 F = +4.6887118E-01 SIGNIFICANCE OF F = NOT SIGNIFICANT  $G_1 = +9.4587268E-03$   
 R = -8.9549758E-02 SIGNIFICANCE OF R = NOT SIGNIFICANT  $S_1 = +8.9538162E-05$   
 t = +6.8474169E-01 SIGNIFICANCE OF t = NOT SIGNIFICANT  $S_2 = +9.5015910E-03$   
 N = 60 DEGREES OF FREEDOM = 58  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 77 DEG F, AMB RH



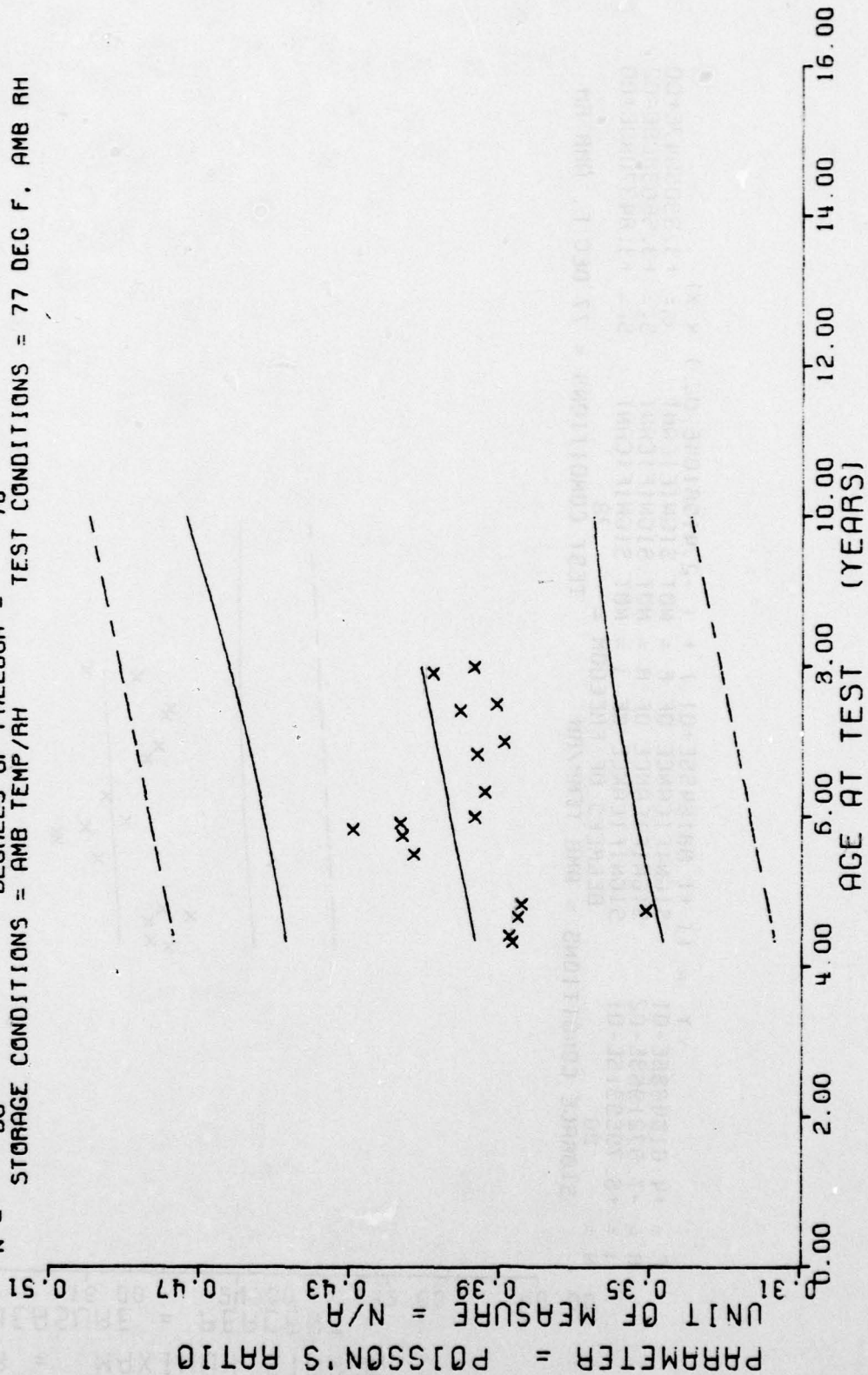
\*\*\* SAMPLE SIZE SUMMARY \*\*\*

AGE (MOS)	NR SAMP
52	6
53	3
55	3
57	3
58	3
66	3
69	15
70	6
71	14
72	3
76	3
92	3
84	3
93	3
90	3
95	3
95	3

ANR 3065 PROPELLANT (ANA), POISSON'S RATIO AT MAX STRAIN, 77 DEG F, UNLND CTNS

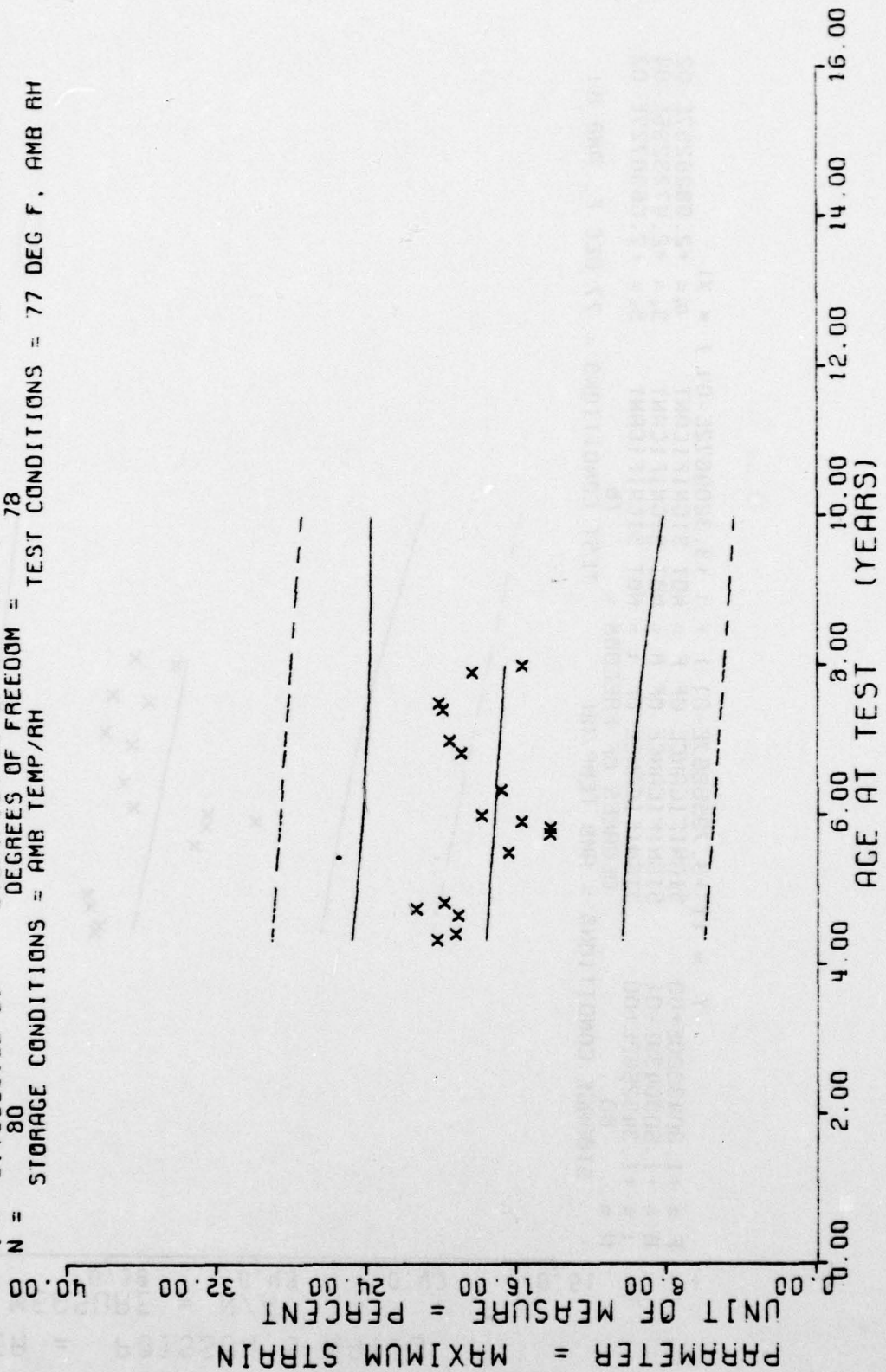
This sample size summary is applicable to figure 6-43 and 644

$Y = ((+3.7955867E-01) + (+3.3209672E-04) \times X)$   
 $F = +1.8043320E+00$  SIGNIFICANCE OF F = NOT SIGNIFICANT  $G_r = +2.6826257E-02$   
 $R = +1.5036439E-01$  SIGNIFICANCE OF R = NOT SIGNIFICANT  $S_e = +2.4723295E-04$   
 $t = +1.3432542E+00$  SIGNIFICANCE OF t = NOT SIGNIFICANT  $S_t = +2.6690727E-02$   
 $N = 80$  DEGREES OF FREEDOM = 78  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 77 DEG F, AMB RH





$Y = ((+1.8816455E+01) + (-2.4196104E-02) \times X)$   
 $F = +4.6184686E-01$  SIGNIFICANCE OF F = NOT SIGNIFICANT  $S_e = +3.8305947E+00$   
 $R = -7.6721968E-02$  SIGNIFICANCE OF R = NOT SIGNIFICANT  $S_a = +3.5603808E-02$   
 $t = +6.7959315E-01$  SIGNIFICANCE OF t = NOT SIGNIFICANT  $S_t = +3.8437089E+00$   
 $N = 80$  DEGREES OF FREEDOM = 78  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 77 DEG F, AMB RH



ANA 3066 PROPELLANT (ANA), STRAIN DILATATION MAXIMUM STRESS, 77 DEG F, UNLND CT

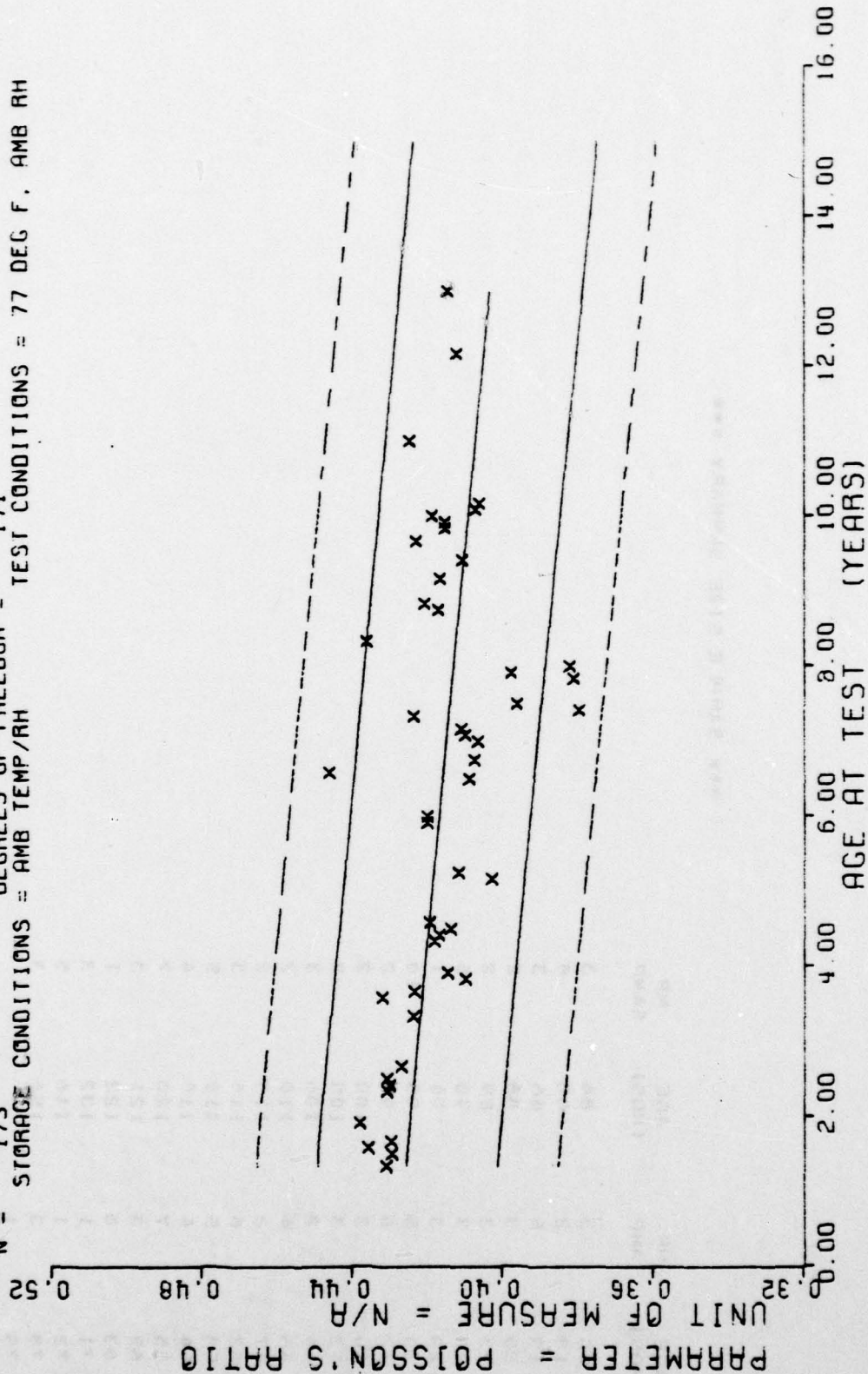
\*\*\* SAMPLE SIZE SUMMARY \*\*\*

AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP
16	3	84	3
18	2	85	8
19	6	86	3
20	3	88	2
23	3	89	2
28	3	90	6
29	3	94	1
30	5	95	10
32	6	96	2
40	3	100	2
43	3	105	2
44	2	106	3
46	4	110	2
47	2	113	2
52	6	116	3
53	5	118	5
54	4	119	4
55	7	120	7
62	3	121	3
63	6	122	1
71	1	132	3
72	1	146	5
78	3	156	3
79	1		
91	6		

ANB 3066 PROPELLANT (ANB 'G'), POISSON'S RATIO @ 15% STN, 77 DEG F, UNLND CTNS

This sample size summary is applicable to figure 6-45

$Y = ((+4.2813354E-01) + (-1.6243275E-04) \times X)$   
 $F = +3.4412028E+01$  SIGNIFICANCE OF F = SIGNIFICANT  $G_1 = +1.4573533E-02$   
 $R = -4.0930043E-01$  SIGNIFICANCE OF R = SIGNIFICANT  $S_0 = +2.7689714E-05$   
 $t = +5.8661766E+00$  SIGNIFICANCE OF t = SIGNIFICANT  $S_1 = +1.3335710E-02$   
 $N = 173$  DEGREES OF FREEDOM = 171  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 77 DEG F, AMB RH



AMB 3066 PROPELLANT (AMB 'C'), POISSON'S RATIO ± 15% STN, 77 DEG F, UNLND CTNS



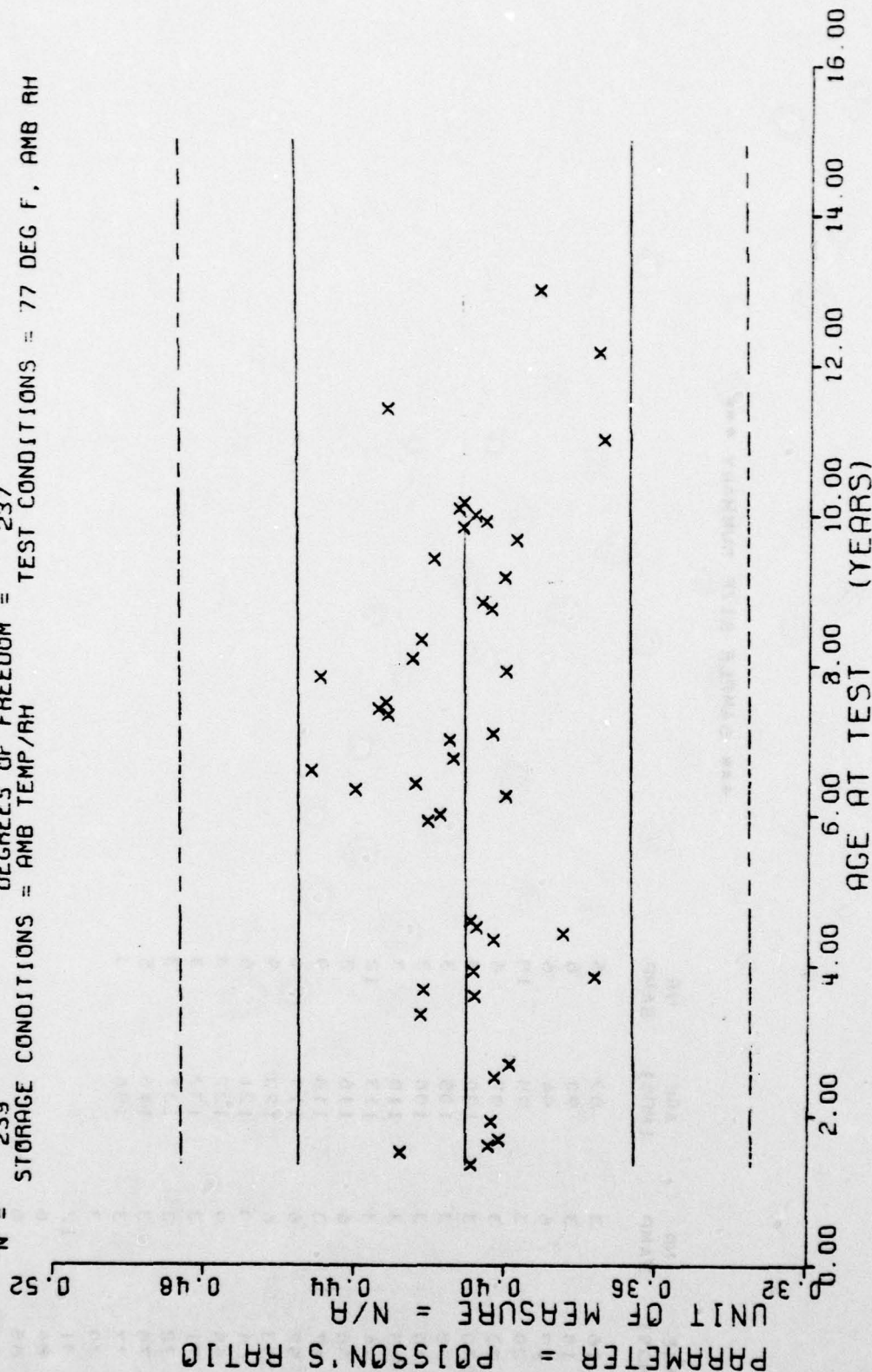
\*\*\* SAMPLE SIZE SUMMARY \*\*\*

AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP
16	3	83	5
18	3	90	6
19	6	94	6
20	3	95	15
23	3	97	6
30	3	100	3
32	3	105	3
40	3	106	3
43	3	110	3
44	3	113	12
46	6	116	3
47	3	118	9
52	6	119	6
53	6	120	9
54	9	121	6
55	9	122	3
71	3	132	3
72	3	137	3
76	3	146	5
77	3	156	3
79	3		
81	12		
84	6		
85	6		
89	9		

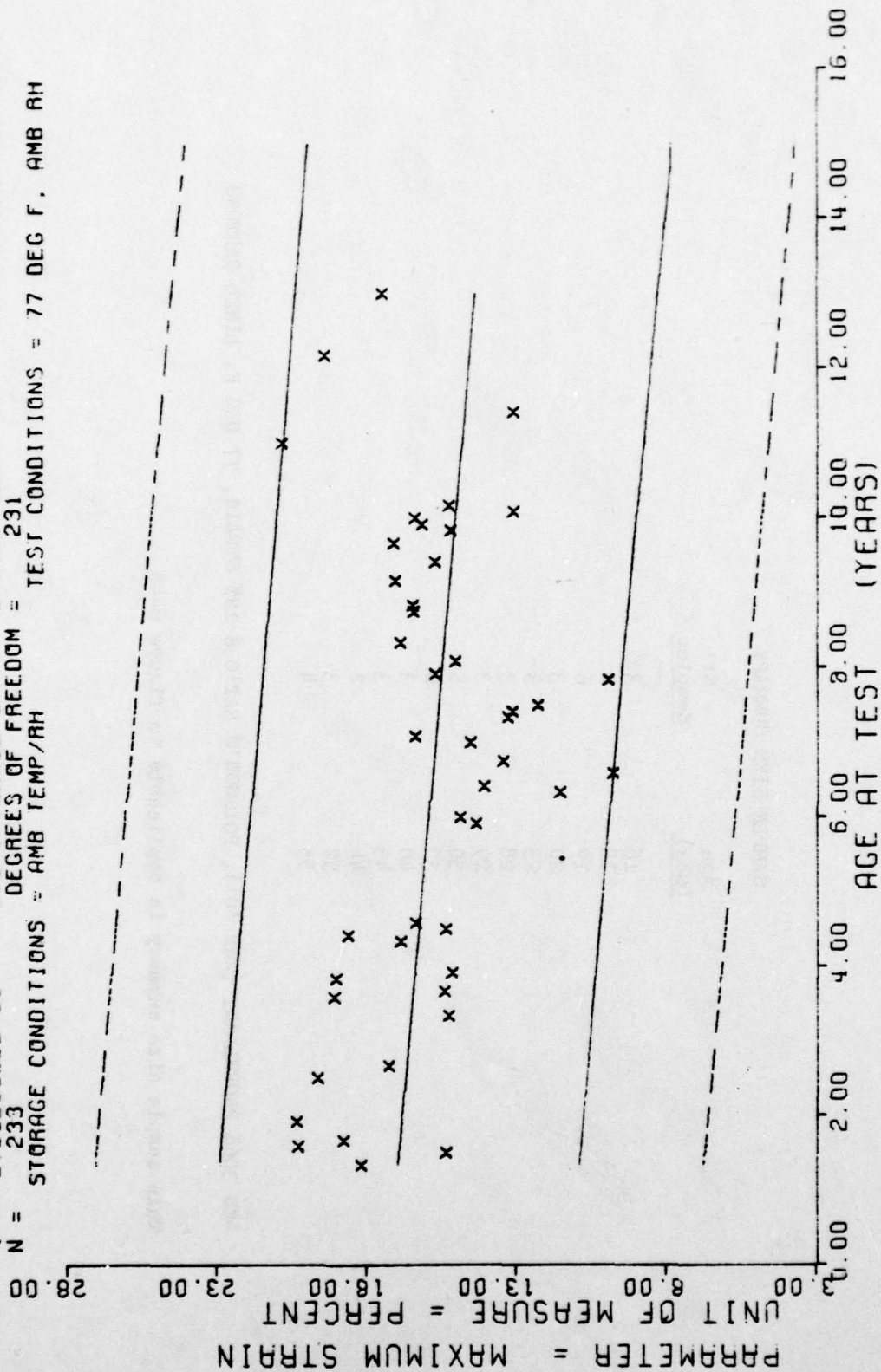
ANR 3366 PROPELLANT (ANR 'G') STN DILATATION MAXIMUM STRAIN, 77 DEG F UNLND CTN

This sample size summary is applicable to figures 6-46 and 6-47

$F = +9.8504461E-02$   
 $R = +2.0382785E-02$   
 $I = +3.1385420E-01$   
 $N = 239$   
 $Y = ((+4.1010824E-01) + (+1.5415876E-05) \times X)$   
 SIGNIFICANCE OF F = NOT SIGNIFICANT  
 SIGNIFICANCE OF R = NOT SIGNIFICANT  
 SIGNIFICANCE OF I = NOT SIGNIFICANT  
 DEGREES OF FREEDOM = 237  
 STORAGE CONDITIONS = AMB TEMP/AH  
 TEST CONDITIONS = 77 DEG F, AMB RH



$Y = ((+1.7214774E+01) + (-1.8721277E-02) * X)$   
 $F = +8.1361668E+00$  SIGNIFICANCE OF F = SIGNIFICANT  $G_r = +3.4283351E+00$   
 $R = -1.8445366E-01$  SIGNIFICANCE OF R = SIGNIFICANT  $S_a = +6.5633498E-03$   
 $I = +2.8523966E+00$  SIGNIFICANCE OF I = SIGNIFICANT  $S_r = +3.3767944E+00$   
 $N = 233$  DEGREES OF FREEDOM = 231  
 STORAGE CONDITIONS = AMB TEMP/AH TEST CONDITIONS = 77 DEG F, AMB RH





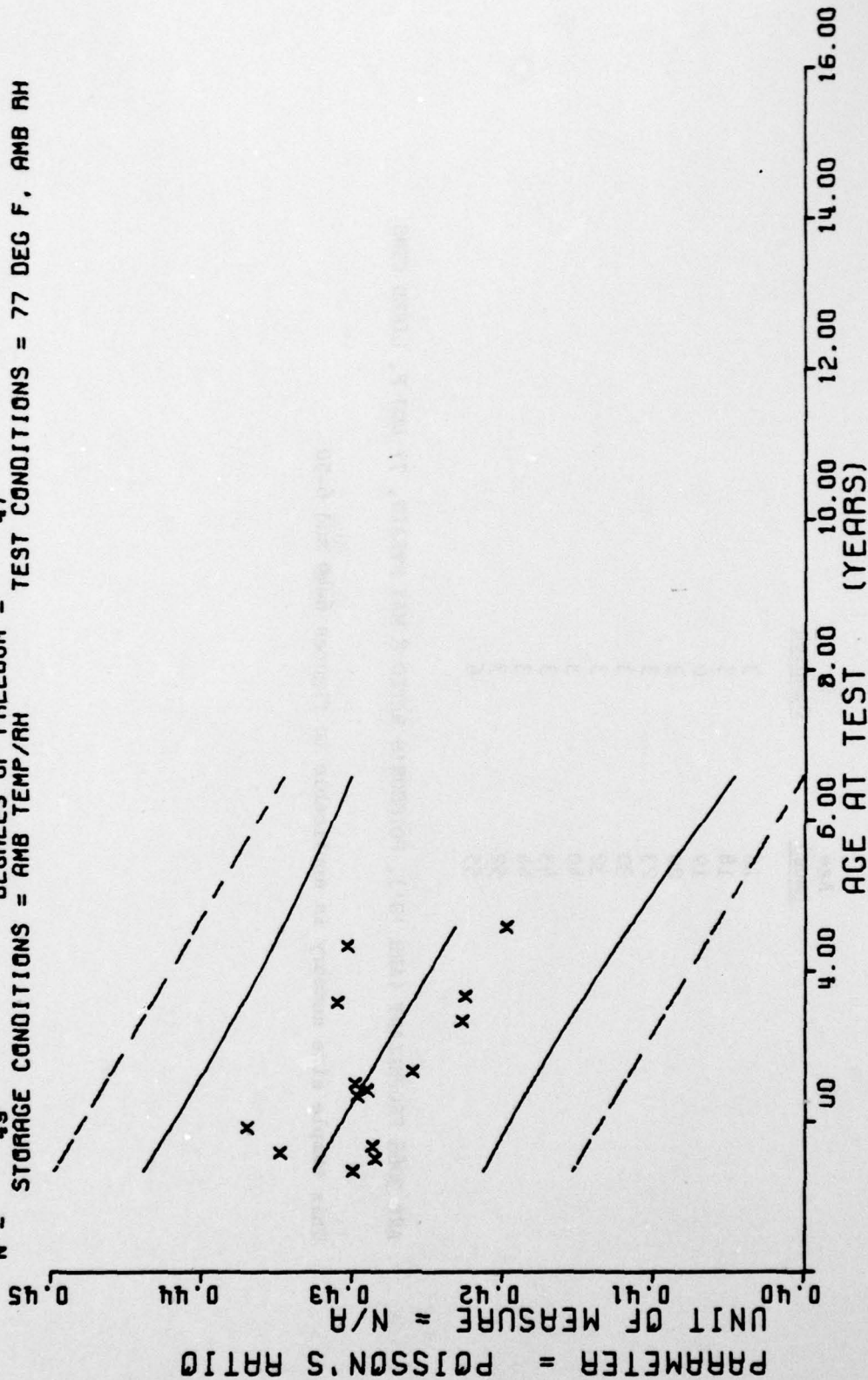
# SAMPLE SIZE SUMMARY

Age (mos)	Nr Samples
16	3
18	2
19	6
20	3
23	3
28	3
29	3
30	5
32	6
40	3
43	3
44	2
52	3
55	4

ANB 3066 PROPELLANT (ANB 'G'), POISSON'S RATIO @ 15% STRAIN, 77 DEG F, LINED CARTONS

This sample size summary is applicable to figure 6-48

$Y = ((+4.3747915E-01) + (-2.4306398E-04) * X)$   
 $F = +1.2674361E+01$  SIGNIFICANCE OF F = SIGNIFICANT  $G_1 = +6.4137395E-03$   
 $R = -4.6086014E-01$  SIGNIFICANCE OF R = SIGNIFICANT  $S_1 = +6.8274347E-05$   
 $t = +3.5601069E+00$  SIGNIFICANCE OF t = SIGNIFICANT  $S_2 = +5.7522538E-03$   
 $N = 49$  DEGREES OF FREEDOM = 47  
 STORAGE CONDITIONS = AMB TEMP/AH TEST CONDITIONS = 77 DEG F, AMB RH



AMB 3066 PROPELLANT (AMB 'G'), POISSON'S RATIO @ 15% STN, 77 DEG F, LINED CTNS

Figure 6-48

# SAMPLE SIZE SUMMARY

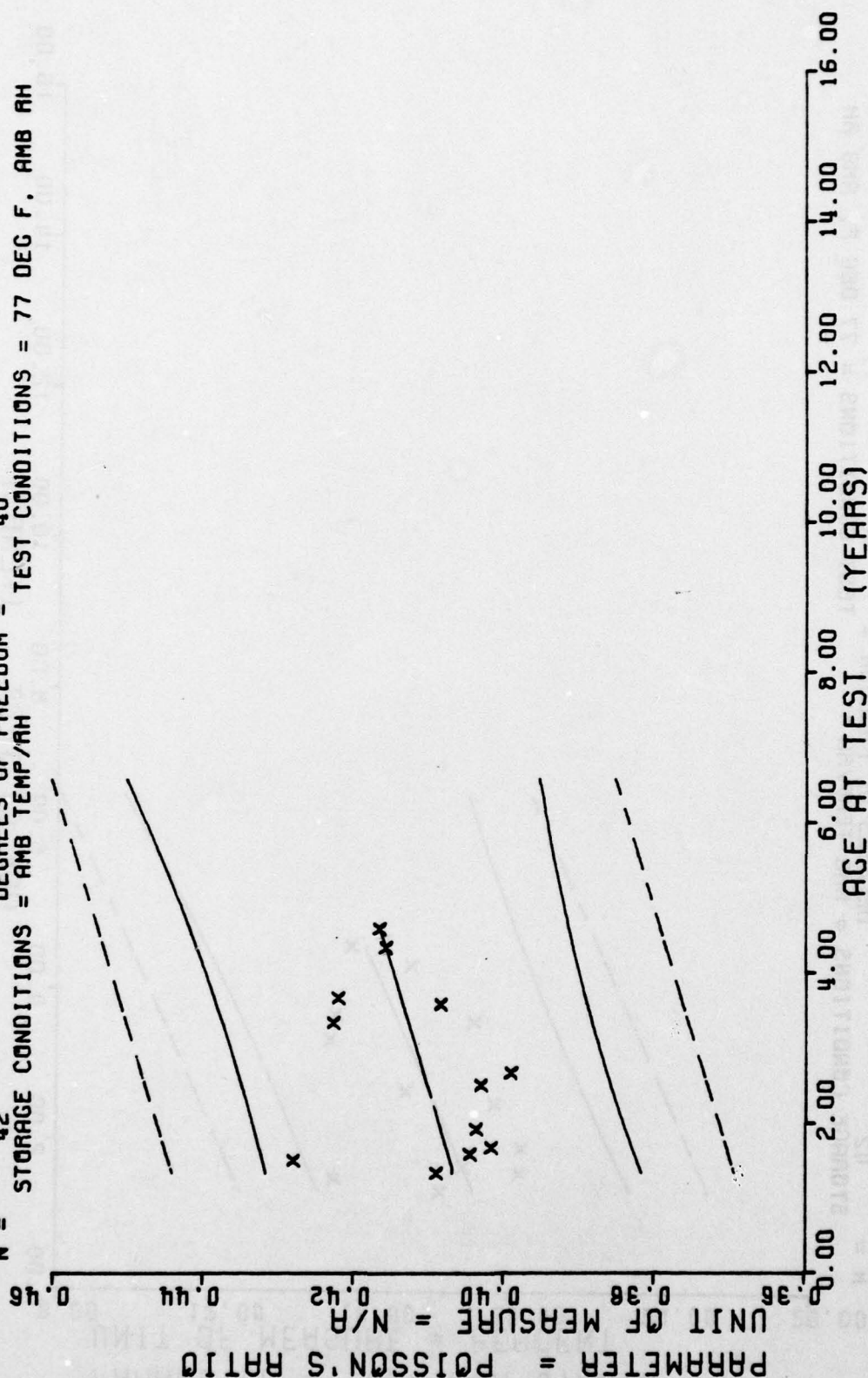
Age (mos)	Nr Samples
16	3
18	3
19	6
20	3
23	3
30	3
32	3
40	3
43	3
44	3
52	3
55	6

ANB 3066 PROPELLANT (ANB 'G'), POISSON'S RATIO @ MAX STRAIN, 77 DEG F, LINED CTNS

This sample size summary is applicable to figures 6-49 and 6-50



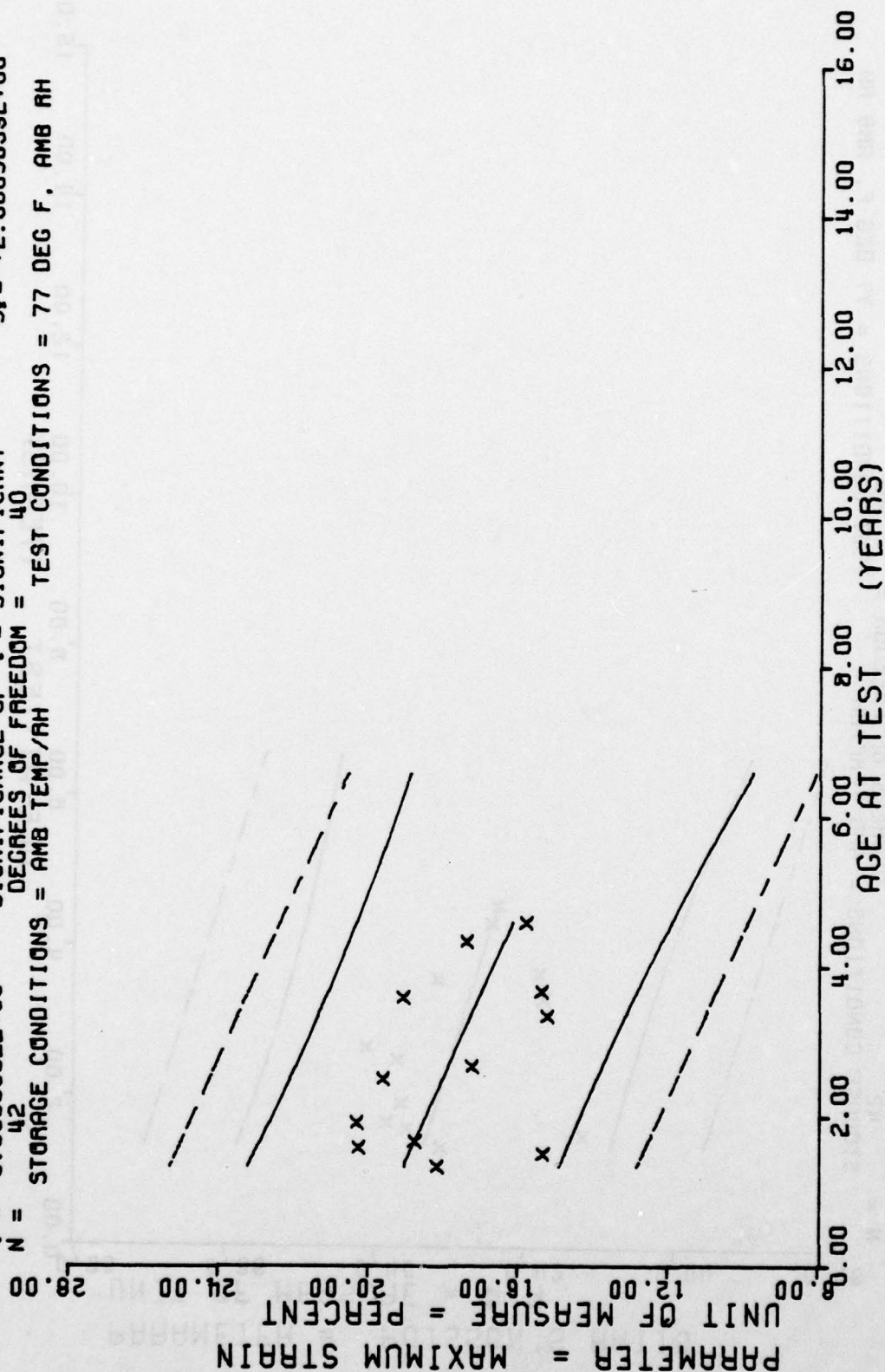
$Y = ((+4.0272209E-01) + (+2.5083846E-04) \times X)$   
 $F = +3.3653692E+00$  SIGNIFICANCE OF F = NOT SIGNIFICANT  $S_r = +1.2848826E-02$   
 $R = +2.7857673E-01$  SIGNIFICANCE OF R = NOT SIGNIFICANT  $S_e = +1.3673439E-04$   
 $t = +1.8344942E+00$  SIGNIFICANCE OF t = NOT SIGNIFICANT  $S_e = +1.2493492E-02$   
 $N = 42$  DEGREES OF FREEDOM = 40  
 STORAGE CONDITIONS = AMB TEMP/AH TEST CONDITIONS = 77 DEG F, AMB AH



AMB 3066 PROPELLANT (AMB 'G'), POISSON'S RATIO • MAX STRAIN, 77 DEG F, LINED CTN

Figure 6-49

$Y = ((+2.0266205E+01) + (-7.5279431E-02) \times X)$   
 $F = +1.0931641E+01$  SIGNIFICANCE OF F = SIGNIFICANT  $\sigma_1 = +2.3186843E+00$   
 $R = -4.6328565E-01$  SIGNIFICANCE OF R = SIGNIFICANT  $S_0 = +2.2768459E-02$   
 $t = +3.3063032E+00$  SIGNIFICANCE OF t = SIGNIFICANT  $S_1 = +2.0803659E+00$   
 $N = 42$  DEGREES OF FREEDOM = 40  
 STORAGE CONDITIONS = AMB TEMP/AH TEST CONDITIONS = 77 DEG F, AMB RH



ANB 3066 PROPELLANT (ANB 'G') STN DILATATION MAXIMUM STRAIN, 77 DEG F LINED CTN

Figure 6-50

\*\*\* SAMPLE SIZE SUMMARY \*\*\*

AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP
13	2	71	3	129	1
15	9	72	16	133	2
16	12	73	2	139	3
17	2	80	12	145	2
19	6	82	3	146	2
22	9	83	3	147	3
23	3	87	6		
24	3	88	3		
29	3	92	2		
22	3	95	1		
23	2	101	3		
34	6	106	3		
35	3	108	1		
38	3	109	7		
40	3	110	6		
41	3	111	9		
44	2	112	3		
49	3	113	2		
52	4	115	2		
54	2	116	3		
55	1	117	1		
59	4	122	2		
62	1	124	4		
65	3	126	2		
67	2	127	2		

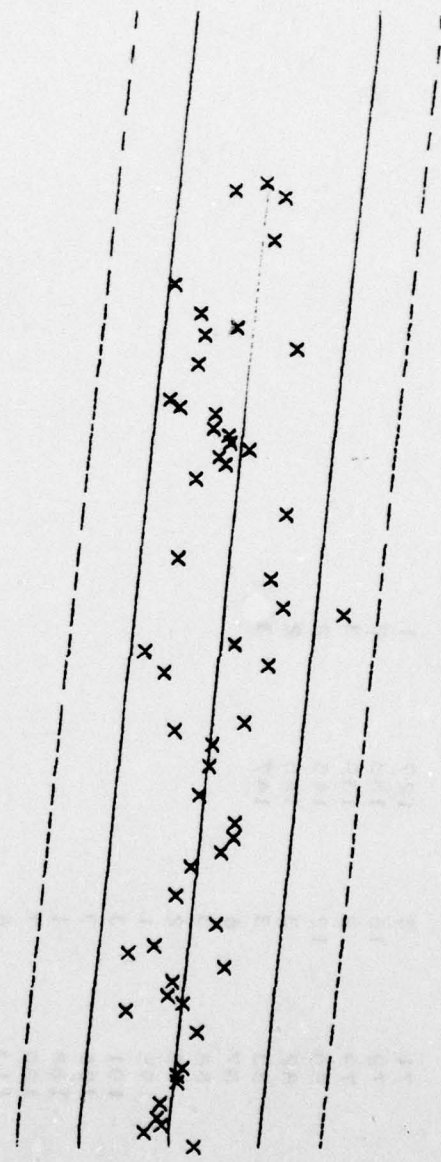
ANR 3066 PROPELLANT (ANB (P)), POISSON'S RATIO @ 15% STN. 77 DEG F, UNLND CTNS

This sample size summary is applicable to figure 6-51



$F = +7.2190313E+01$   
 $R = -5.1032922E-01$   
 $l = +8.4964882E+00$   
 $N = 207$   
 STORAGE CONDITIONS = AMB TEMP/RH  
 $Y = (( +4.3323632E-01 ) + ( -1.7351834E-04 ) * X)$   
 SIGNIFICANCE OF F = SIGNIFICANT  
 SIGNIFICANCE OF R = SIGNIFICANT  
 SIGNIFICANCE OF l = SIGNIFICANT  
 DEGREES OF FREEDOM = 205  
 $\sigma_v = +1.3548376E-02$   
 $S_o = +2.0422360E-05$   
 $S_e = +1.1679704E-02$   
 TEST CONDITIONS = 77 DEG F, AMB RH

PARAMETER = POISSON'S RATIO  
 UNIT OF MEASURE = N/R  
 0.52  
 0.48  
 0.44  
 0.40  
 0.36  
 0.32



AGE AT TEST (YEARS)

AMB 3066 PROPELLANT (AMB 'P'), POISSON'S RATIO @ 15% STN, 77 DEG F., UNLND CTNS

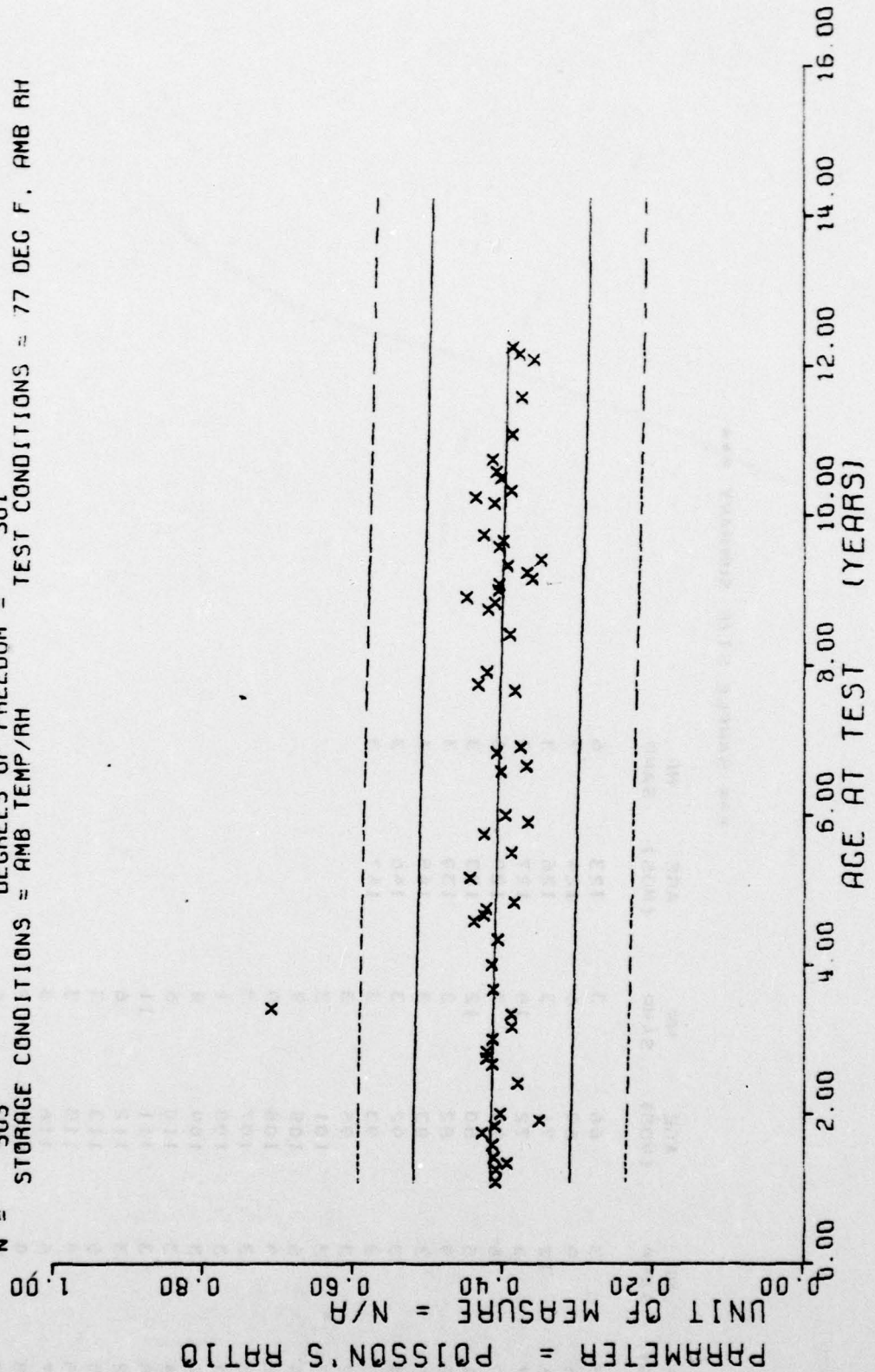
\*\*\* SAMPLE SIZE SUMMARY \*\*\*

AGE (MJS)	NP SAMP	AGE (MJS)	NP SAMP	AGE (MJS)	NP SAMP
13	3	66	3	123	6
15	9	69	6	124	9
16	12	71	3	126	3
17	3	72	18	127	3
18	6	73	3	129	6
21	6	80	12	133	3
22	9	82	3	139	3
23	3	83	3	145	3
24	3	92	3	146	3
29	3	93	3	147	3
32	3	95	3		
33	3	101	3		
34	6	105	9		
36	9	106	9		
39	3	107	3		
40	3	108	1		
41	3	109	8		
44	3	110	6		
48	3	111	11		
52	3	112	6		
55	6	113	3		
56	8	115	3		
57	6	116	3		
58	8	117	3		
62	3	122	6		

ANN 3066 PROPELLANT (ANR ·P·). POISSON'S RATIO @ MAX STRAIN. 77 DEG F. UNLND CTN

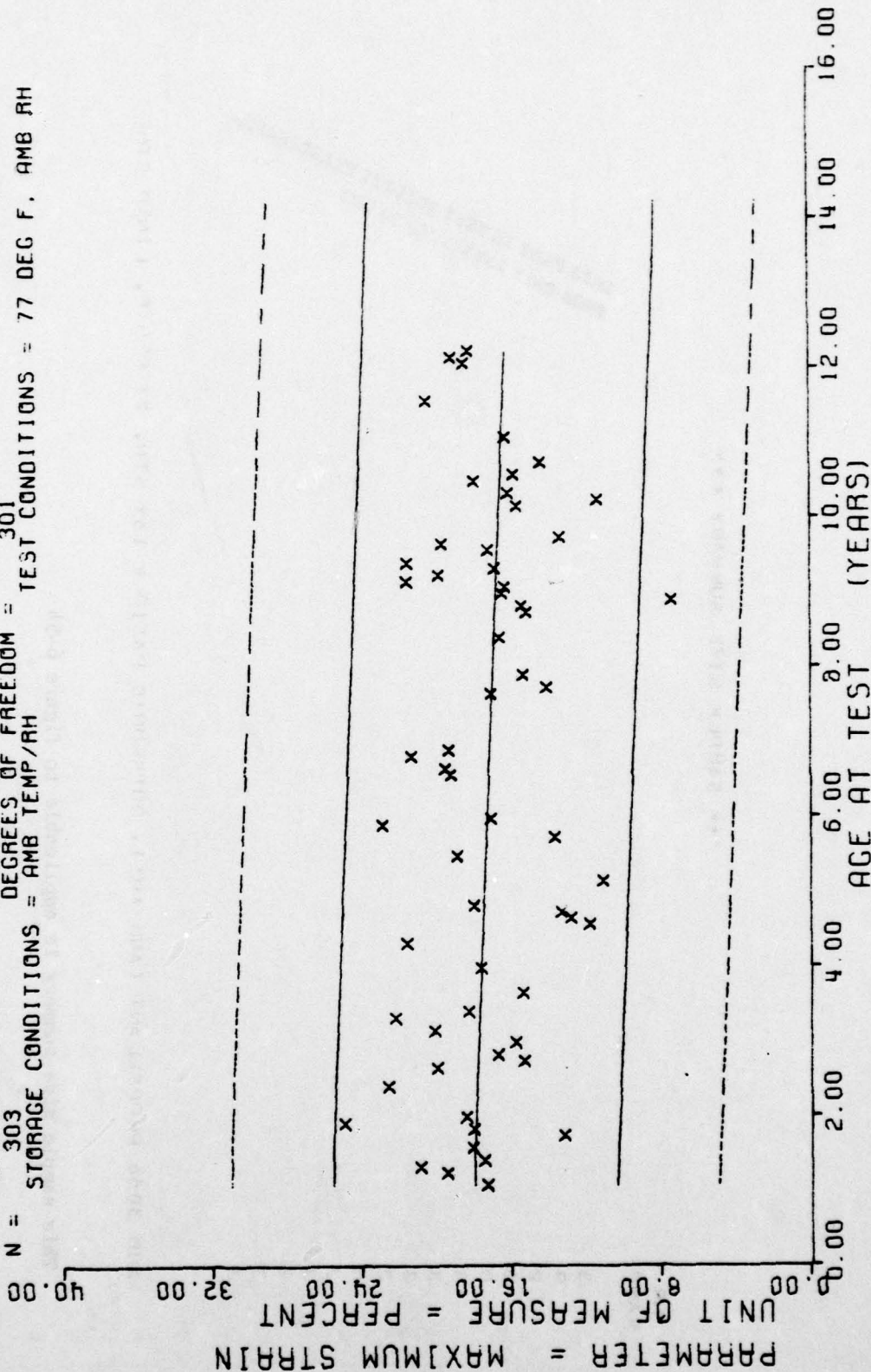
This sample size summary is applicable to figures 6-52 and 6-53

$F = +5.2570036E+00$   
 $R = -1.3101653E-01$   
 $t = +2.2928156E+00$   
 $N = 303$   
 $Y = (( +4.1394269E-01 ) + ( -1.9698037E-04 ) * X)$   
 SIGNIFICANCE OF F = SIGNIFICANT  
 SIGNIFICANCE OF R = SIGNIFICANT  
 SIGNIFICANCE OF t = SIGNIFICANT  
 DEGREES OF FREEDOM = 301  
 STORAGE CONDITIONS = AMB TEMP/RH  
 TEST CONDITIONS = 77 DEG F, AMB RH





$Y = ((+1.8117458E+01) + (-1.4319563E-02) \times X)$   
 $F = +5.2010224E+00$  SIGNIFICANCE OF F = SIGNIFICANT  $G = +4.3709282E+00$   
 $R = -1.3032899E-01$  SIGNIFICANCE OF R = SIGNIFICANT  $S = +6.2789266E-03$   
 $t = +2.2805750E+00$  SIGNIFICANCE OF t = SIGNIFICANT  $S_t = +4.3408404E+00$   
 $N = 303$  DEGREES OF FREEDOM = 301  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 77 DEG F, AMB RH



AMB 3066 PROPELLANT (AMB 'P') STN DILATATION MAXIMUM STRAIN, 77 DEG F UNLND CTN

THIS PAGE IS BEST QUALITY PHOTOGRAPH  
FROM COPY FURNISHED TO DDC

\*\*\* SAMPLE SIZE SUMMARY \*\*\*

AGE (MJS)	NR SAMP
15	3
16	9
17	2
18	6
22	9
23	3
24	3
32	3
33	2
34	6
40	3
41	3
44	2
48	3
55	3

6 - 84

AME 3066 PROPELLANT (AME 00), POISSON'S RATIO @ 15% STN, 77 DEG F, LINED CTNS

This sample size summary is applicable to figure 6-54

$Y = ((+4.3636344E-01) + (-1.6256358E-04) * X)$   
 $F = +8.3327170E+00$  SIGNIFICANCE OF F = SIGNIFICANT  $G = +6.0312510E-03$   
 $R = -3.5535701E-01$  SIGNIFICANCE OF R = SIGNIFICANT  $S_0 = +5.6149628E-05$   
 $t = +2.8952922E+00$  SIGNIFICANCE OF t = SIGNIFICANT  $S_1 = +5.6859874E-03$   
 $N = 60$  DEGREES OF FREEDOM = 58  
 STORAGE CONDITIONS = AMB TEMP/AH TEST CONDITIONS = 77 DEG F, AMB RH

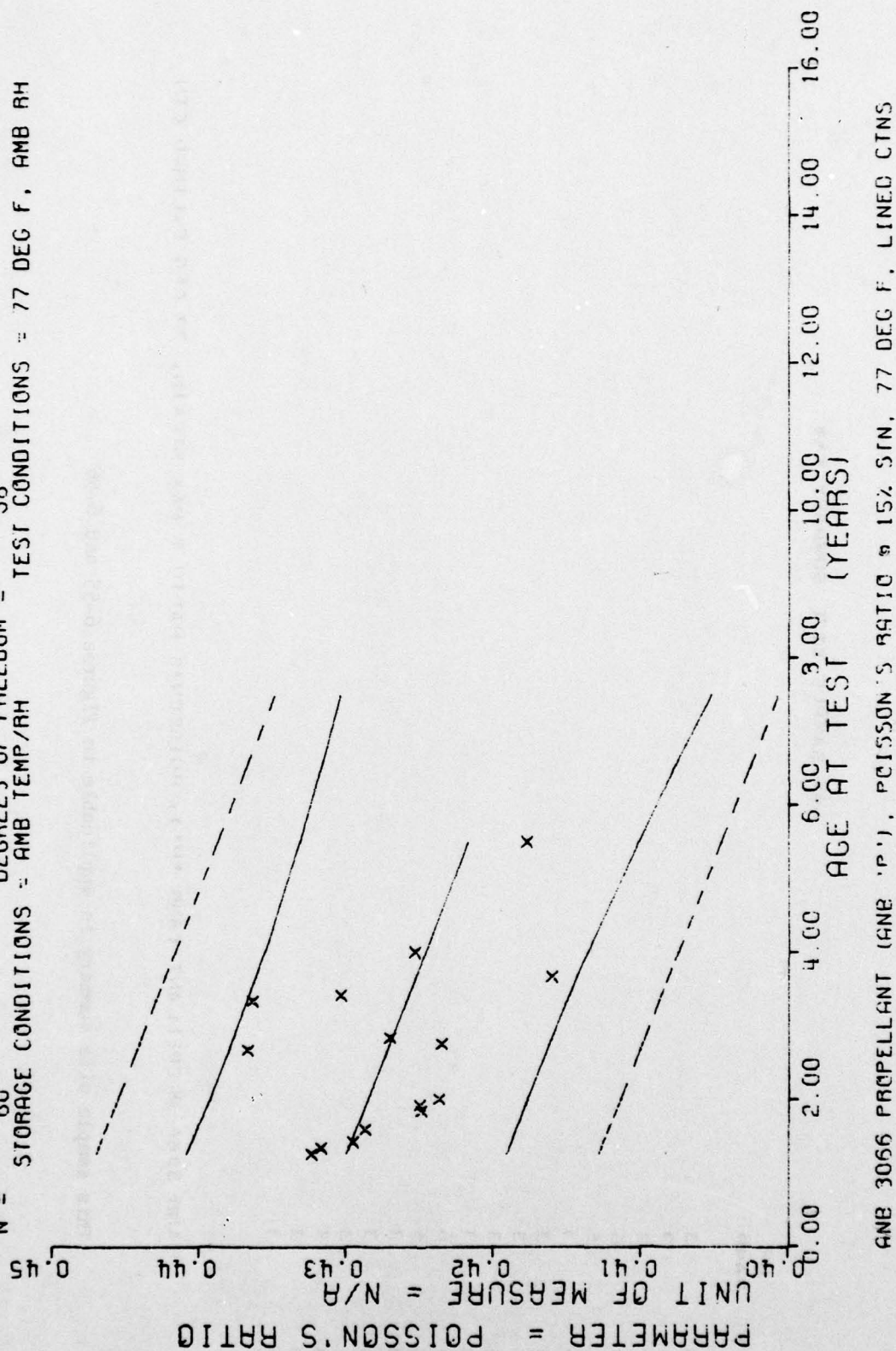


Figure 6-54



\*\*\* SAMPLE SIZE SUMMARY \*\*\*

AGE (MO5)	NR SAMP
15	3
16	3
17	3
18	6
21	6
22	3
23	3
24	3
12	3
33	3
34	6
35	6
40	3
41	3
44	3
43	3
54	3
64	3

AMR 3066 DECELLANT (AMR .P.), POISSON'S RATIO @ MAX STRAIN. 77 DEG F, LINED CTN

This sample size summary is applicable to figures 6-55 and 6-56

$F = +1.0298502E+00$  SIGNIFICANCE OF F = NOT SIGNIFICANT  $\sigma_r = +1.0304224E-01$   
 $R = +1.1562653E-01$  SIGNIFICANCE OF R = NOT SIGNIFICANT  $S_a = +8.7698023E-04$   
 $L = +1.0148153E+00$  SIGNIFICANCE OF L = NOT SIGNIFICANT  $S_v = +1.0302228E-01$   
 $N = 78$  DEGREES OF FREEDOM = 76  
 STORAGE CONDITIONS = AMB TEMP/AH TEST CONDITIONS = 77 DEG F, AMB RH

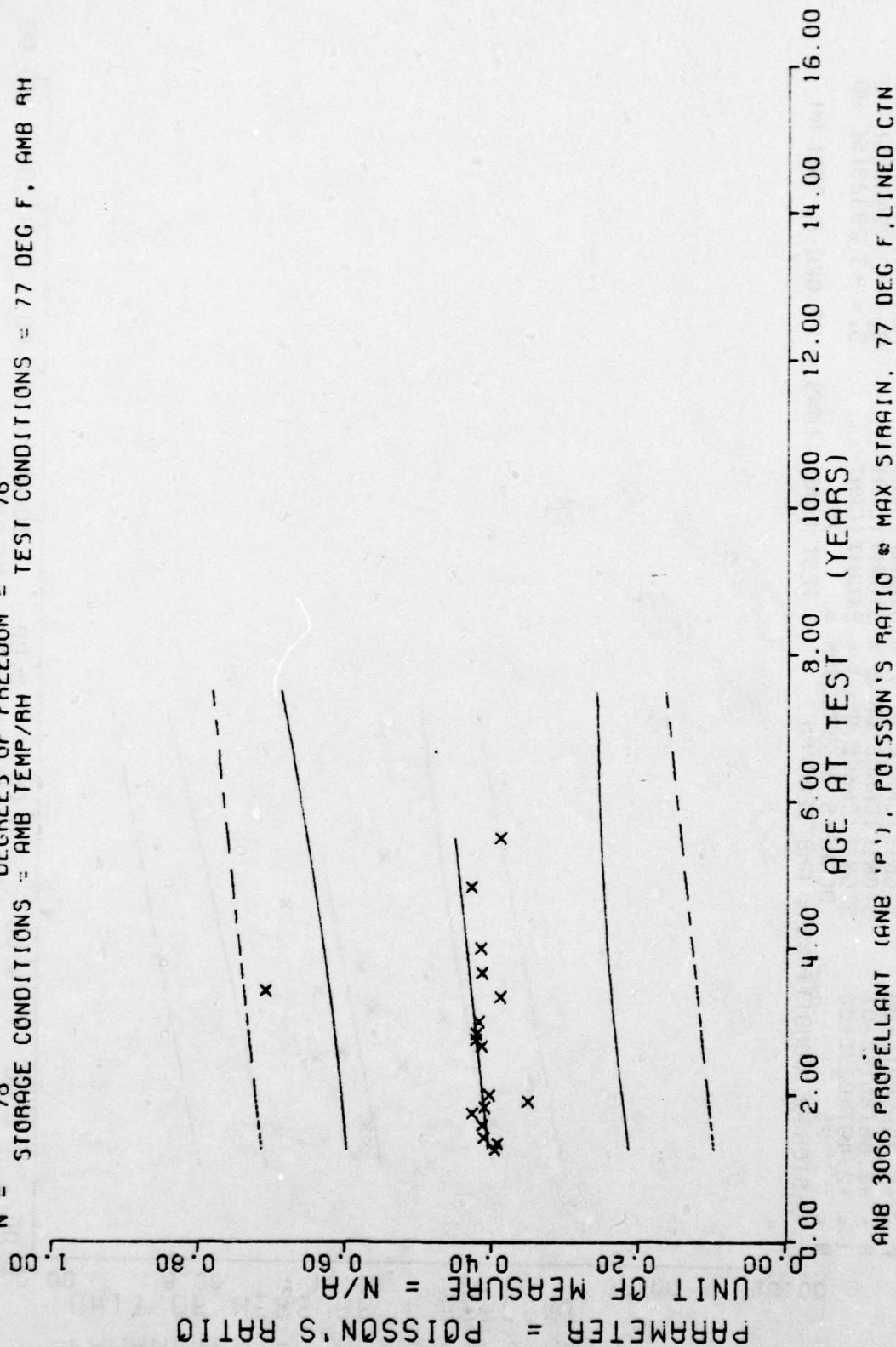
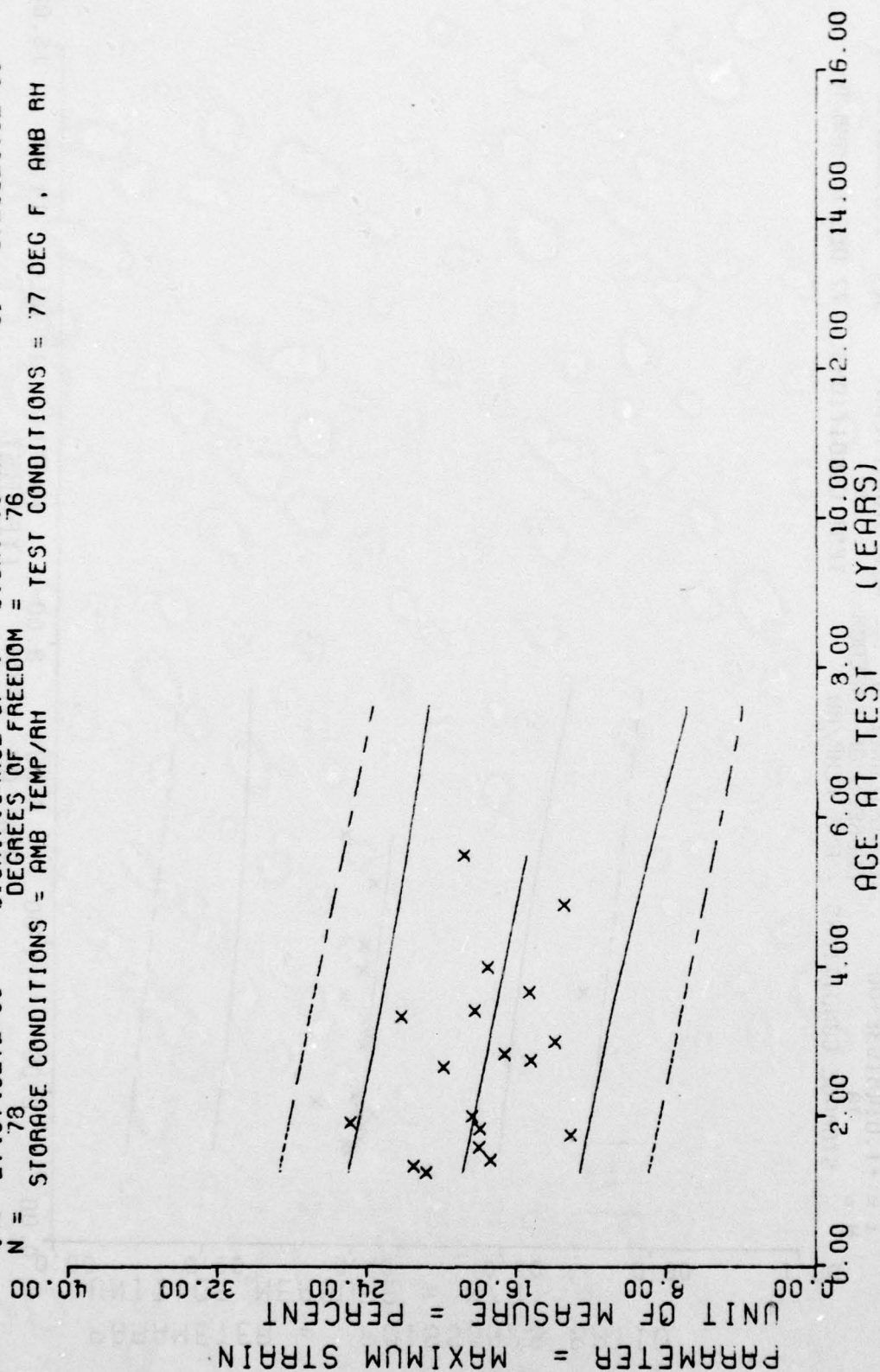


Figure 6-55

$F = +5.7955881E+00$   
 $R = -2.6618514E-01$   
 $t = +2.4074027E+00$   
 $N = 78$   
 $Y = ((+1.9836849E+01) + (-6.7283551E-02) * X)$   
 SIGNIFICANCE OF F = SIGNIFICANT  
 SIGNIFICANCE OF R = SIGNIFICANT  
 SIGNIFICANCE OF t = SIGNIFICANT  
 DEGREES OF FREEDOM = 76  
 STORAGE CONDITIONS = AMB TEMP/RH  
 TEST CONDITIONS = 77 DEG F, AMB RH



ANB 3066 PROPELLANT (ANB 'P') SIN DILATATION MAXIMUM STRAIN, 77 DEG F LINED CTN

Figure 6-56



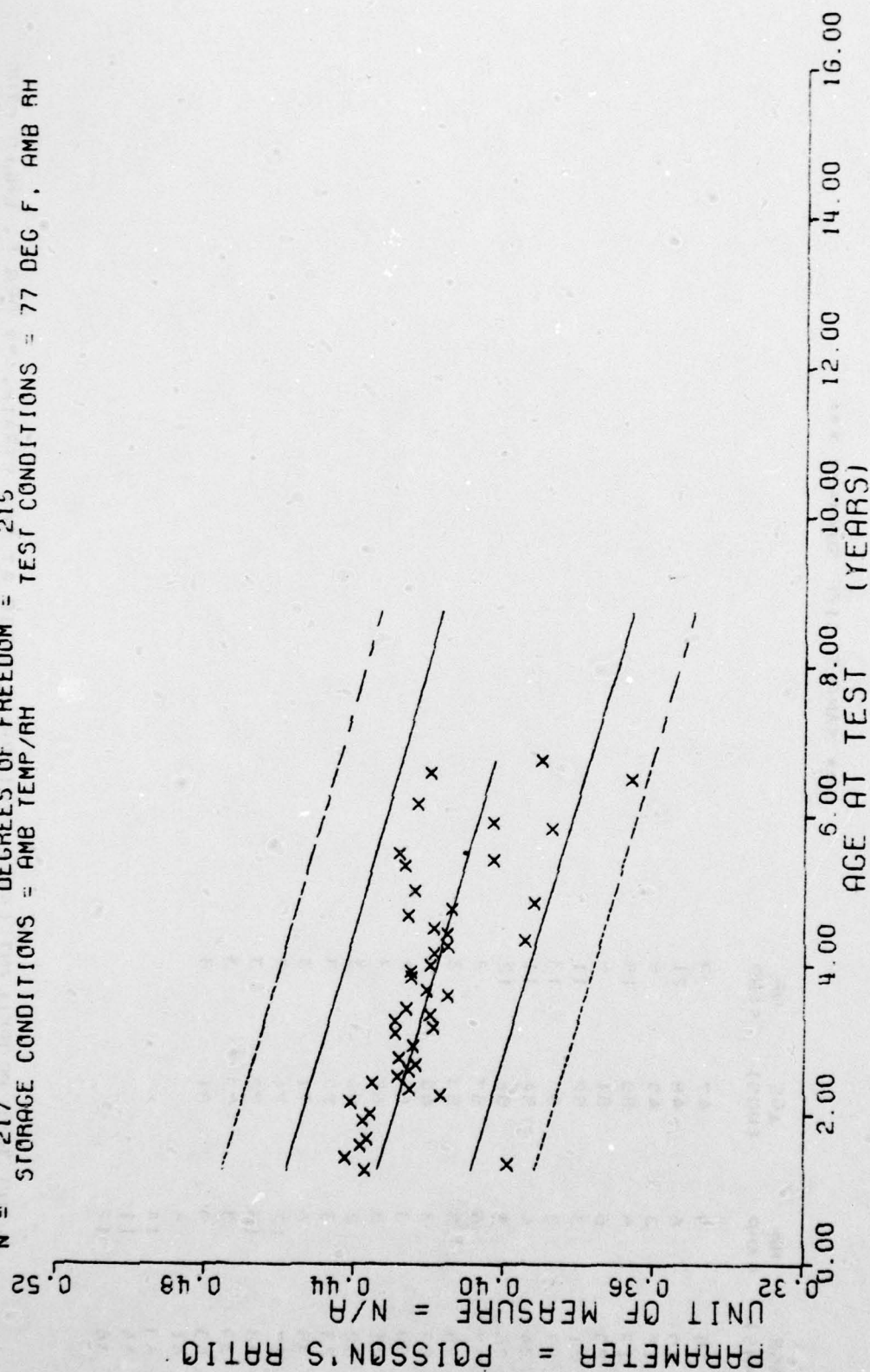
\*\*\* SAMPLE SIZE SUMMARY \*\*\*

AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP
15	3	47	3
16	6	48	21
17	3	49	5
18	5	50	18
20	6	51	5
21	3	52	11
23	3	53	13
24	2	54	11
26	4	56	12
27	5	57	3
28	2	58	3
29	3	60	5
30	3	64	2
31	3	65	5
32	2	66	3
33	3	70	3
35	6	71	3
37	15	74	3
38	15	78	3
39	3	79	3
40	9	81	3
41	6		
43	14		
44	11		
46	12		

AGE 30-56 PROPPELLANT (ANT). POISSON'S RATIO AT MAX STRAIN, 77 DEG F, LNLD CTNS

This sample size summary is applicable to figure 6-57

$Y = ((+4.4041022E-01) + (-4.7033594E-04) \times X)$   
 $F = +6.0558762E+01$  SIGNIFICANCE OF F = SIGNIFICANT  $G_1 = +1.5678139E-02$   
 $R = -4.6879328E-01$  SIGNIFICANCE OF R = SIGNIFICANT  $S_0 = +6.0439334E-05$   
 $t = +7.7819510E+00$  SIGNIFICANCE OF t = SIGNIFICANT  $S_1 = +1.3880793E-02$   
 $N = 217$  DEGREES OF FREEDOM = 215  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 77 DEG F, AMB RH



ANB 3066 PROPELLANT (ANT), POISSON'S RATIO AT 15% STRAIN, 77 DEG F, UNLND CTNS

Figure 6-57

\*\*\* SAMPLE SIZE SUMMARY \*\*\*

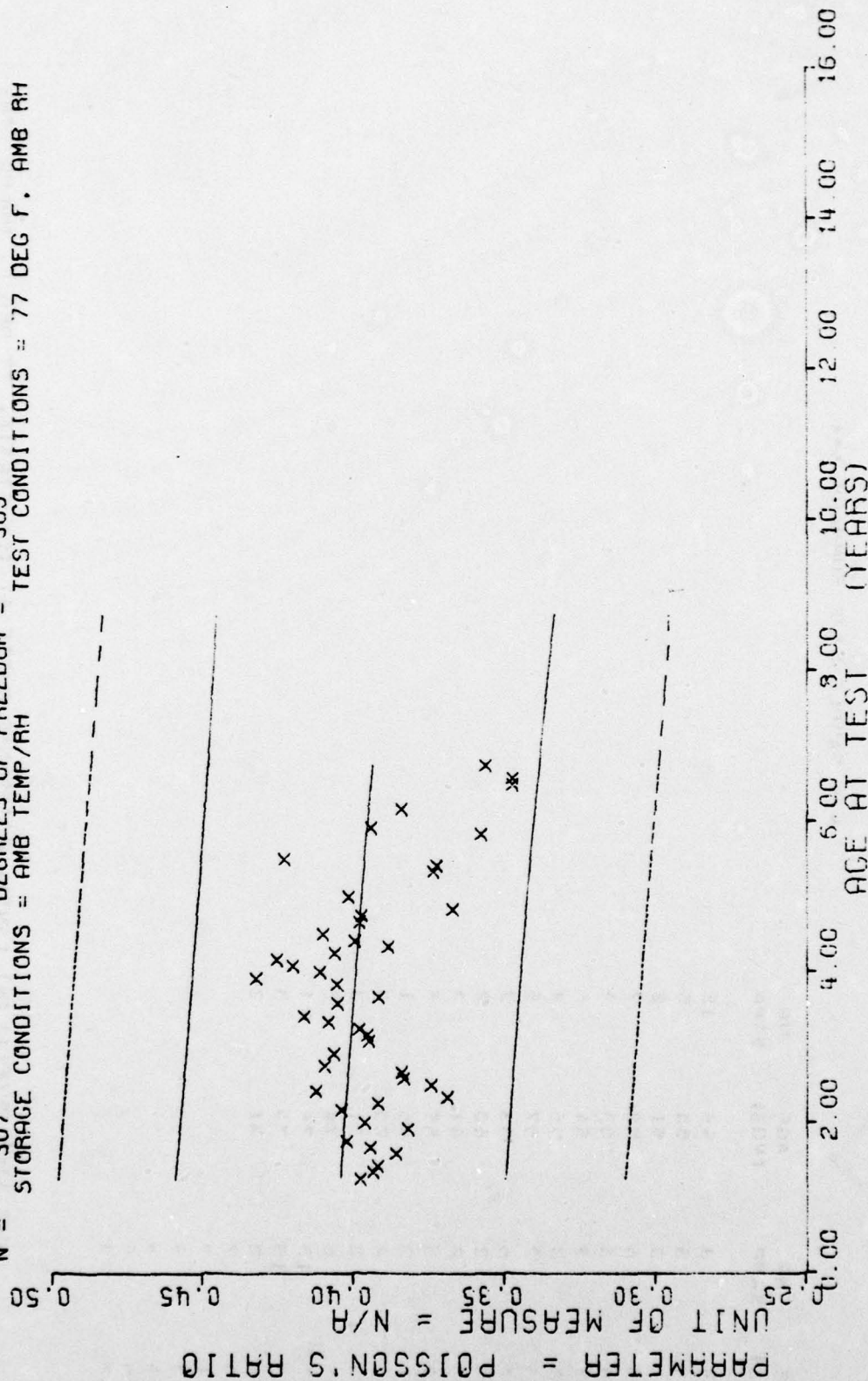
AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP
15	3	49	15
16	5	50	5
17	3	51	2
18	6	52	7
19	5	53	0
20	3	54	6
21	3	55	4
22	2	56	5
23	2	57	3
24	2	58	2
25	2	59	2
26	2	60	2
27	3	61	2
28	3	62	1
29	2	63	3
30	3	64	3
31	3	65	3
32	2	66	1
33	3	67	3
34	3	68	3
35	6	69	1
36	13	70	3
37	15	71	3
38	3	72	3
39	7	73	1
40	2	74	3
41	2	75	2
42	2	76	2
43	2	77	2
44	2	78	2
45	2	79	2
46	2	80	2
47	2	81	2

AGE 1066 POPULANT (ANT). POISSON'S RATIO AT 1% STRAIN, 77 DEG F, UNIND CTNS

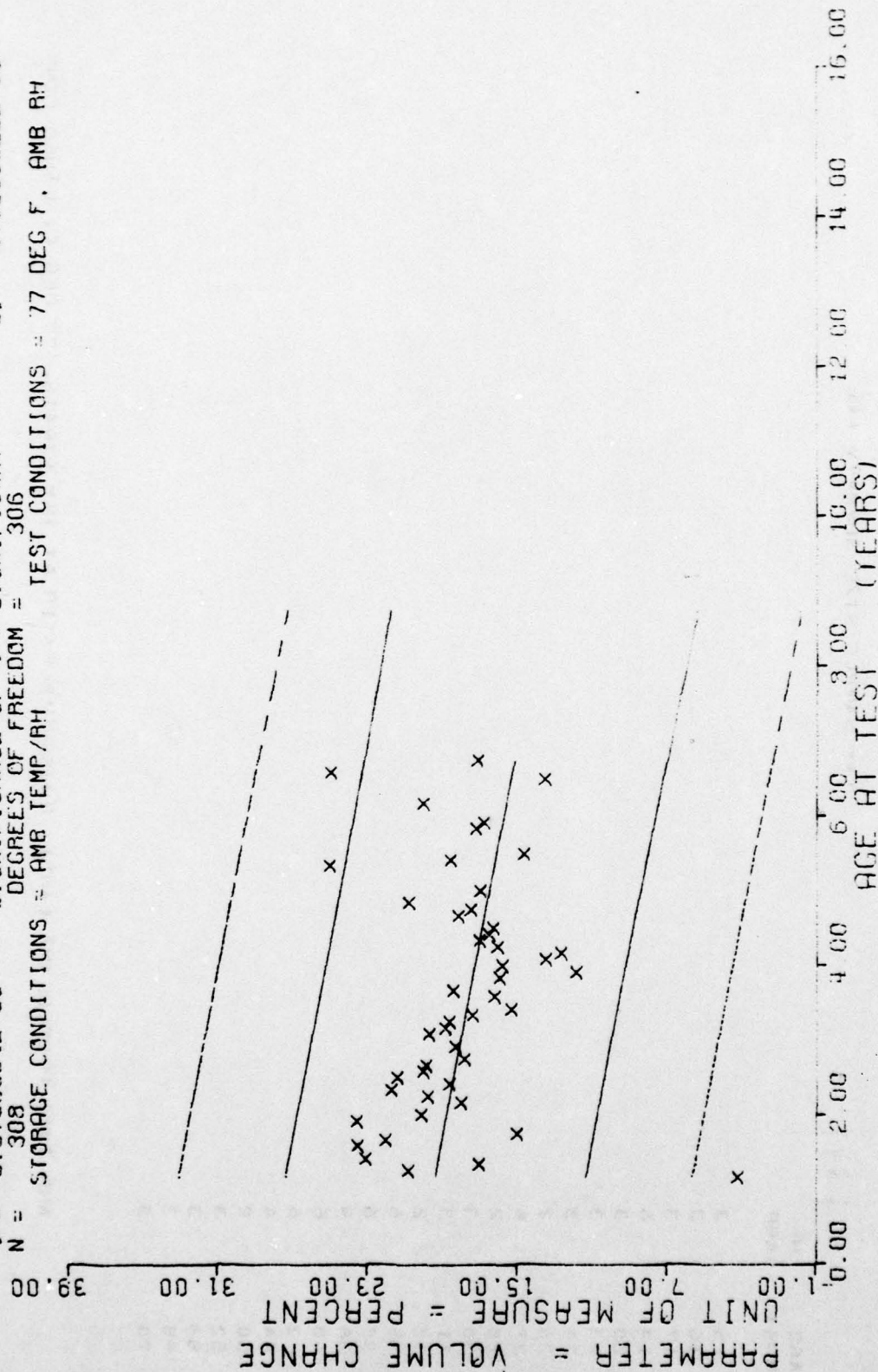
This sample size summary is applicable to figures 6-58 and 6-59



$F = +1.9250028E+00$   
 $R = -7.9195325E-02$   
 $t = +1.3874447E+00$   
 $N = 307$   
 STORAGE CONDITIONS = AMB TEMP/AM  
 DEGREES OF FREEDOM = 305  
 $Y = ((+4.0686321E-01) + (-1.6850760E-04) * X)$   
 SIGNIFICANCE OF F = NOT SIGNIFICANT  
 SIGNIFICANCE OF R = NOT SIGNIFICANT  
 SIGNIFICANCE OF t = NOT SIGNIFICANT  
 $S_e = +3.1365654E-02$   
 $S_b = +1.2145176E-04$   
 $S_e = +3.1318354E-02$   
 TEST CONDITIONS = 77 DEG F, AMB RH



$Y = ((+2.0290093E+01) + (-6.4627787E-02) * X)$   
 $F = +1.3539503E+01$  SIGNIFICANCE OF F = SIGNIFICANT  $G = +4.6522594E+00$   
 $R = -2.0584441E-01$  SIGNIFICANCE OF R = SIGNIFICANT  $S_a = +1.7563776E-02$   
 $L = +3.6796064E+00$  SIGNIFICANCE OF L = SIGNIFICANT  $S_v = +4.5600628E+00$   
 $N = 308$  DEGREES OF FREEDOM = 306  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 77 DEG F, AMB RH



AMB 3055 PROPELLANT (ANTI), STRAIN DILATATION MAXIMUM STRAIN, 77 DEG F, UNLND CT

Figure 6-59

\*\*\* SAMPLE SIZE SUMMARY \*\*\*

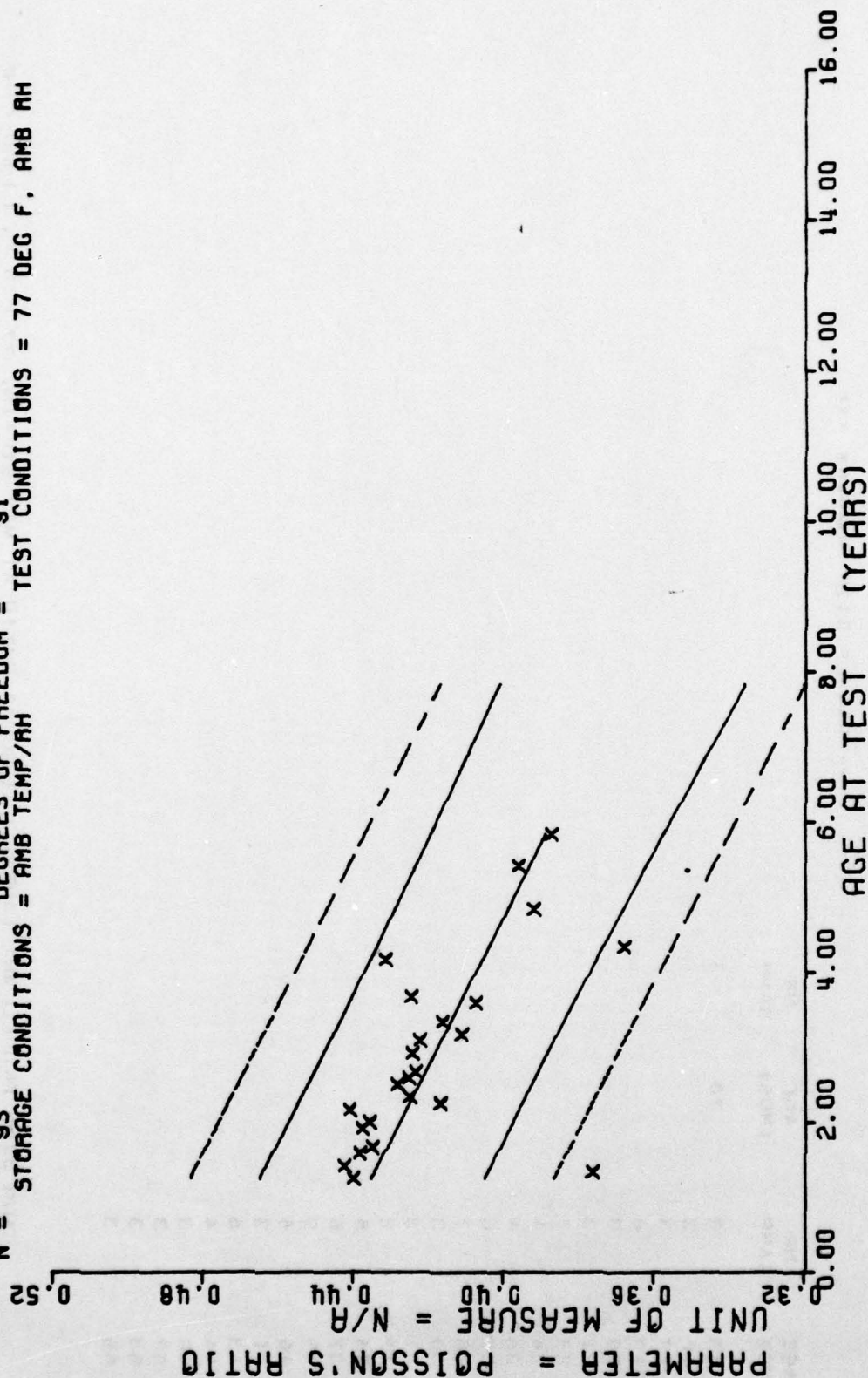
AGE (MJS)	NR SAMP
15	3
16	3
17	3
18	6
20	3
21	3
24	3
25	2
27	6
28	2
30	3
31	3
32	2
35	6
37	6
38	9
40	6
43	6
44	4
50	2
52	3
54	3
55	3
70	3

AIR 3966 PROPELLANT (ANT). POISSON'S RATIO AT 15% STRAIN. -- DEG F, LINED CTNS

This sample size summary is applicable to figure 6-60



$Y = ((+4.477199E-01) + (-8.4455219E-04) \times X)$   
 $F = +4.7666461E+01$  SIGNIFICANCE OF F = SIGNIFICANT  
 $R = -5.8630114E-01$  SIGNIFICANCE OF R = SIGNIFICANT  
 $l = +6.9040902E+00$  SIGNIFICANCE OF  $l$  = SIGNIFICANT  
 $N = 93$  DEGREES OF FREEDOM = 91  
 STORAGE CONDITIONS = AMB TEMP/AH TEST CONDITIONS = 77 DEG F, AMB RH



ANB 3066 PROPELLANT (ANT), POISSON'S RATIO AT 15% STRAIN, 77 DEG F, LINED CTNS

Figure 6-60

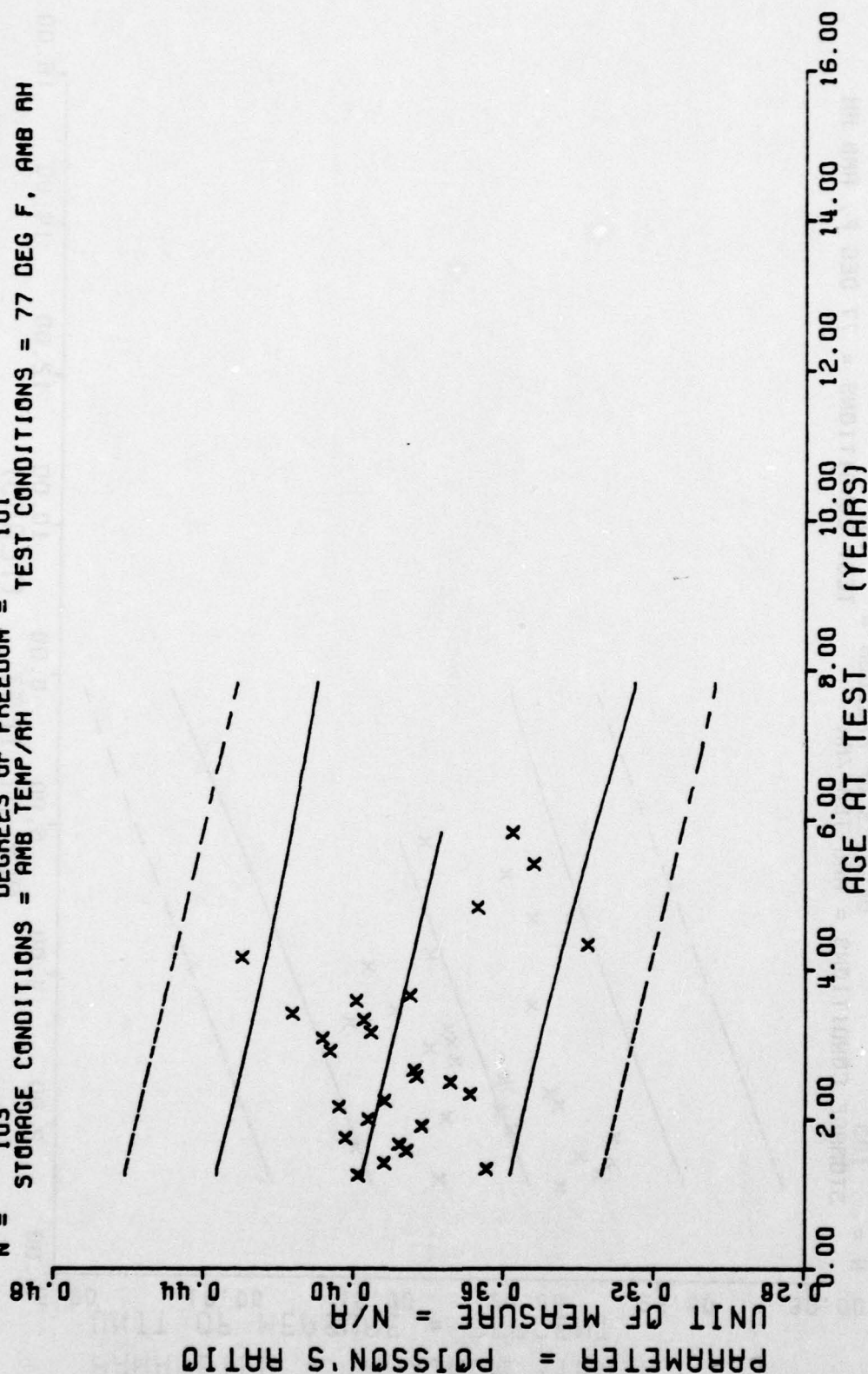
# \*\*\* SAMPLE SIZE SUMMARY \*\*\*

AGE (MOS)	NR SAMP	AGE (MOS)	NP SAMP
15	3	70	3
16	3		
17	3		
19	6		
20	3		
21	3		
23	3		
24	4		
26	4		
27	6		
28	2		
30	3		
31	3		
32	2		
35	5		
37	6		
39	9		
40	5		
41	3		
43	6		
44	4		
50	3		
52	3		
53	3		
65	3		

AND 3066 PROPPELLANT (ANT). POISSON'S RATIO AT MAX STRAIN, 77 DEG F, 1100 CIPS

This sample size summary is applicable to figures 6-61 and 6-62

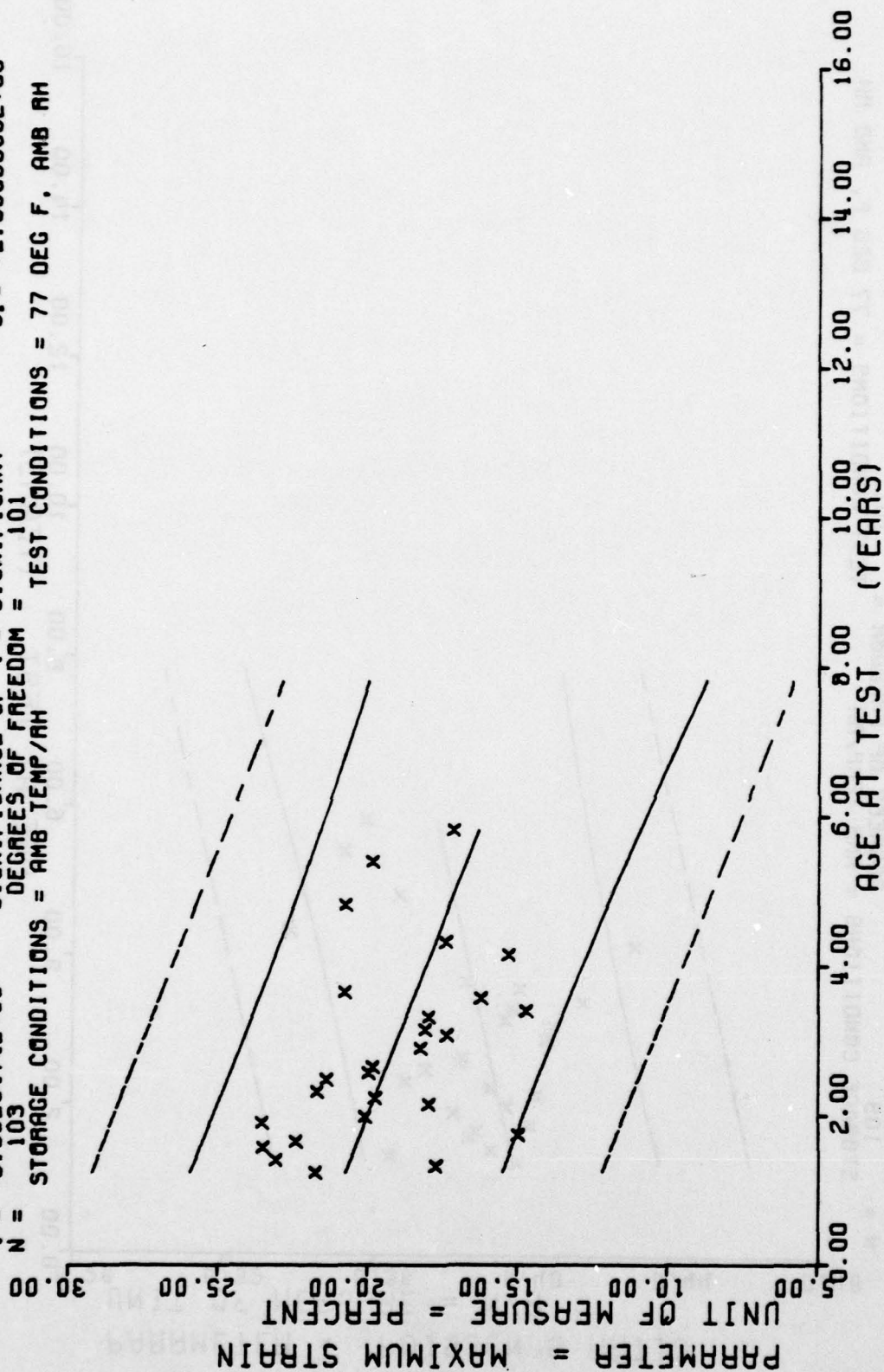
$F = +6.1747516E+00$   
 $A = -2.4002888E-01$   
 $I = +2.4849047E+00$   
 $N = 103$   
 $Y = ((+4.0347455E-01) + (-3.8613253E-04) \times X)$   
 SIGNIFICANCE OF F = SIGNIFICANT  
 SIGNIFICANCE OF A = SIGNIFICANT  
 SIGNIFICANCE OF I = SIGNIFICANT  
 DEGREES OF FREEDOM = 101  
 STORAGE CONDITIONS = AMB TEMP/AH  
 TEST CONDITIONS = 77 DEG F, AMB RH



ANB 3066 PROPELLANT (ANT), POISSON'S RATIO AT MAX STRAIN, 77 DEG F, LINED CTNS



$F = +1.5077281E+01$  SIGNIFICANCE OF  $F =$  SIGNIFICANT  $\sigma = +3.0250434E+00$   
 $R = -3.6040259E-01$  SIGNIFICANCE OF  $R =$  SIGNIFICANT  $S_e = +2.0859216E-02$   
 $t = +3.8829474E+00$  SIGNIFICANCE OF  $t =$  SIGNIFICANT  $S_t = +2.8356856E+00$   
 $N = 103$  DEGREES OF FREEDOM = 101  
 STORAGE CONDITIONS = AMB TEMP/AH TEST CONDITIONS = 77 DEG F, AMB RH



ANB 3066 PROPELLANT (ANT), STRAIN DILATATION MAXIMUM STRESS, 77 DEG F, LINED CT

Figure 6-62

## SECTION VII

### THERMAL COEFFICIENT OF LINEAR EXPANSION

Thermal coefficient of linear expansion is run on the DuPont 990 Thermal Analyzer using the thermomechanical analyzer with expansion probe. The specimen used is a wafer approximately .200" (.508 cm) thick by .33" (.84 cm) diameter. The specimen is cooled to  $-110^{\circ}\text{C}$  ( $-166^{\circ}\text{F}$ ) then heated at  $5^{\circ}\text{C}/\text{min}$  ( $9^{\circ}\text{F}/\text{min}$ ) to  $40^{\circ}\text{C}$  ( $104^{\circ}\text{F}$ ). The glass point ( $T_g$ ), TCLE below  $T_g$  and TCLE above  $T_g$  are determined.

According to ASPC, where a volume coefficient of expansion is determined, the glass point for propellant stored at  $80^{\circ}\text{F}$  ranges from  $-91^{\circ}\text{C}$  ( $-132^{\circ}\text{F}$ ) to  $-79.5^{\circ}\text{C}$  ( $-111^{\circ}\text{F}$ ). Values at OO-ALC are determined from slopes drawn from  $-110^{\circ}\text{C}$  and from  $-20^{\circ}\text{C}$  (see Figure 7-22). ANA "G" and ANT "P" unlined and ANB "P" lined cartons do not show a trend. All others show a significant lowering of the glass point.

Expansion below the glass point is not considered to be a significant factor in analysis. This region is linear. Lined cartons of ANB "P" and ANT "P" do not show a trend. Others show a significant increase except for ANB "G" lined cartons which show a significant decrease (Table 7-1).

TCLE above  $T_g$  does not show a trend for ANB "G" unlined and ANB "P" lined cartons. Others show a significant increase except for ANT "P" lined cartons which show a significant decrease (Figure 7-21).

The region above the glass point shows deviations from linearity as the temperature increases. Figure 7-22 shows this as a dotted line. Using this extrapolated line from  $-110^{\circ}\text{C}$  to  $40^{\circ}\text{C}$  the TCLE would be  $10.32 \times 10^{-5} \text{ in/in}/^{\circ}\text{C}$  or  $5.73 \times 10^{-5} \text{ in/in}/^{\circ}\text{F}$ . The line above  $T_g$  would give

$10.68 \times 10^{-5}$  in/in/ $^{\circ}\text{C}$  or  $5.93 \times 10^{-5}$  in/in/ $^{\circ}\text{F}$ . Current practice at OO-ALC uses the actual trace. Using the trace from  $-110^{\circ}\text{C}$  to  $40^{\circ}\text{C}$  the TCLE would be  $9.31 \times 10^{-5}$  in/in/ $^{\circ}\text{C}$  or  $5.17 \times 10^{-5}$  in/in/ $^{\circ}\text{F}$ . For the slope above  $T_g$ , the TCLE would be  $9.46 \times 10^{-5}$  in/in/ $^{\circ}\text{C}$  or  $5.25 \times 10^{-5}$  in/in/ $^{\circ}\text{F}$ . Both sets of values are within normal limits as determined at ASPC, but the second method more accurately reflects the average TCLE. Figure 23 shows a similar curve for one lot of "G" propellant. The values here run higher. The extrapolated line gives  $11.56 \times 10^{-5}$  and  $11.96 \times 10^{-5}$  in/in/ $^{\circ}\text{C}$  for  $-110^{\circ}$  to  $40^{\circ}$  and  $T_g$  to  $40$  or  $6.42 \times 10^{-5}$  and  $6.56 \times 10^{-5}$  in/in/ $^{\circ}\text{F}$ . When the trace is used the values are  $10.27$  and  $10.40 \times 10^{-5}$  in/in/ $^{\circ}\text{C}$  and  $5.70$  and  $5.68 \times 10^{-5}$  in/in/ $^{\circ}\text{F}$ . The extrapolated TCLE above  $T_g$  does not show a trend for ANB "G" unlined and ANB "P" lined cartons. Others show a significant increase except for ANT "P" lined cartons which show a significant decrease (Figure 7-21). Values are higher than those reported by ASPC.

The temperature range over which thermal expansion is measured must be known before strict comparisons are made. ASPC has reported measurements made for the range  $40$  to  $130^{\circ}\text{F}$ , or  $0$  to  $145^{\circ}\text{F}$ . Figures 7-24 and 7-25 show how the values differ for the two temperature ranges calculated from the same run. Lots are the same as for Figures 7-22 and 7-23.



TABLE 7-1

TCLE

## Significance of Regression Slopes

SYSTEM	Tg	Fig	Below Tg	Fig	Above Tg	Fig
ANA "G" Unlined	NS	7-1	Sig inc	7-2	Sig inc	7-3
ANB "G" Unlined	Sig dec	7-4	Sig inc	7-5	NS	7-6
ANB "G" Lined	Sig dec	7-7	Sig dec	7-8	Sig inc	7-9
ANB "P" Unlined	sig dec	7-10	Sig inc	7-11	Sig inc	7-12
ANB "P" Lined	NS	7-13	NS	7-14	NS dec	7-15
ANT "P" Unlined	NS	7-16	Sig inc	7-17	Sig inc	7-18
ANT "P" Lined	Sig dec	7-19	NS	7-20	Sig cec	7-21

NS = Not significantly different from zero slope

Sig dec = Negative slope

Sig inc = Positive slope

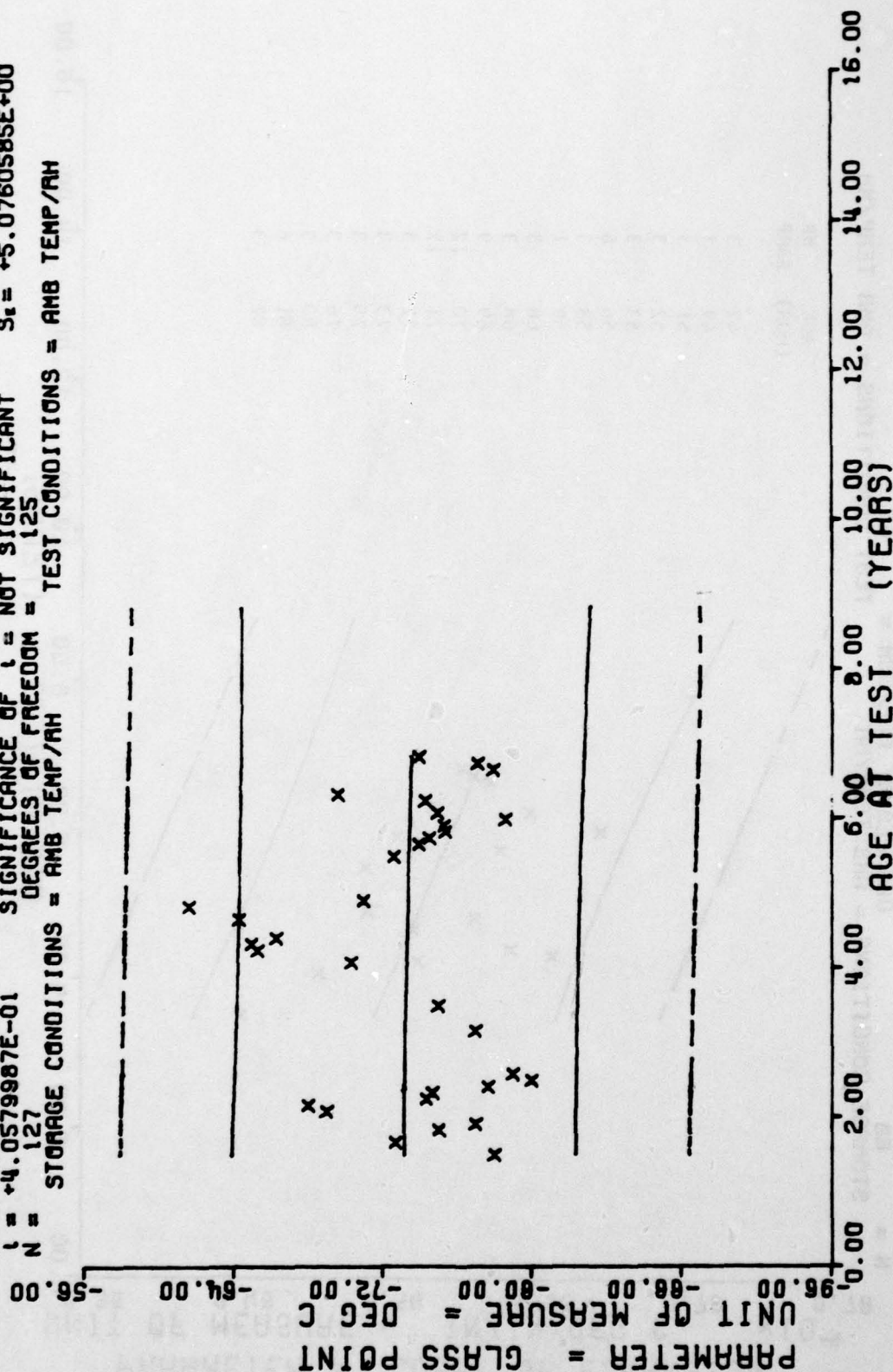
SAMPLE SIZE SUMMARY

<u>Age (mos)</u>	<u>Nr Samples</u>	<u>Age (mos)</u>	<u>Nr Samples</u>
18	3	72	3
20	6	73	3
22	3	75	3
23	3	76	3
25	3	80	3
26	3	81	6
27	3	82	3
28	3		
29	3		
30	3		
31	3		
38	3		
42	3		
49	3		
51	3		
52	3		
53	3		
56	6		
58	3		
59	1		
66	3		
68	3		
69	9		
70	12		
71	12		

ANB 3066 PROPELLANT (ANA, G POLYMER) GLASS POINT UNLINED CTS

This sample size summary is applicable to Figure 7-1

$Y = ((-7.2950982E+01) + (-8.7333636E-03) * X)$   
 $F = +1.6467353E-01$  SIGNIFICANCE OF F = NOT SIGNIFICANT  $\sigma = +5.0592045E+00$   
 $R = -3.6271959E-02$  SIGNIFICANCE OF R = NOT SIGNIFICANT  $S_e = +2.1521356E-02$   
 $t = +4.0579987E-01$  SIGNIFICANCE OF t = NOT SIGNIFICANT  $S_e = +5.0760585E+00$   
 $N = 127$  DEGREES OF FREEDOM = 125  
 STORAGE CONDITIONS = AMB TEMP/AH TEST CONDITIONS = AMB TEMP/AH

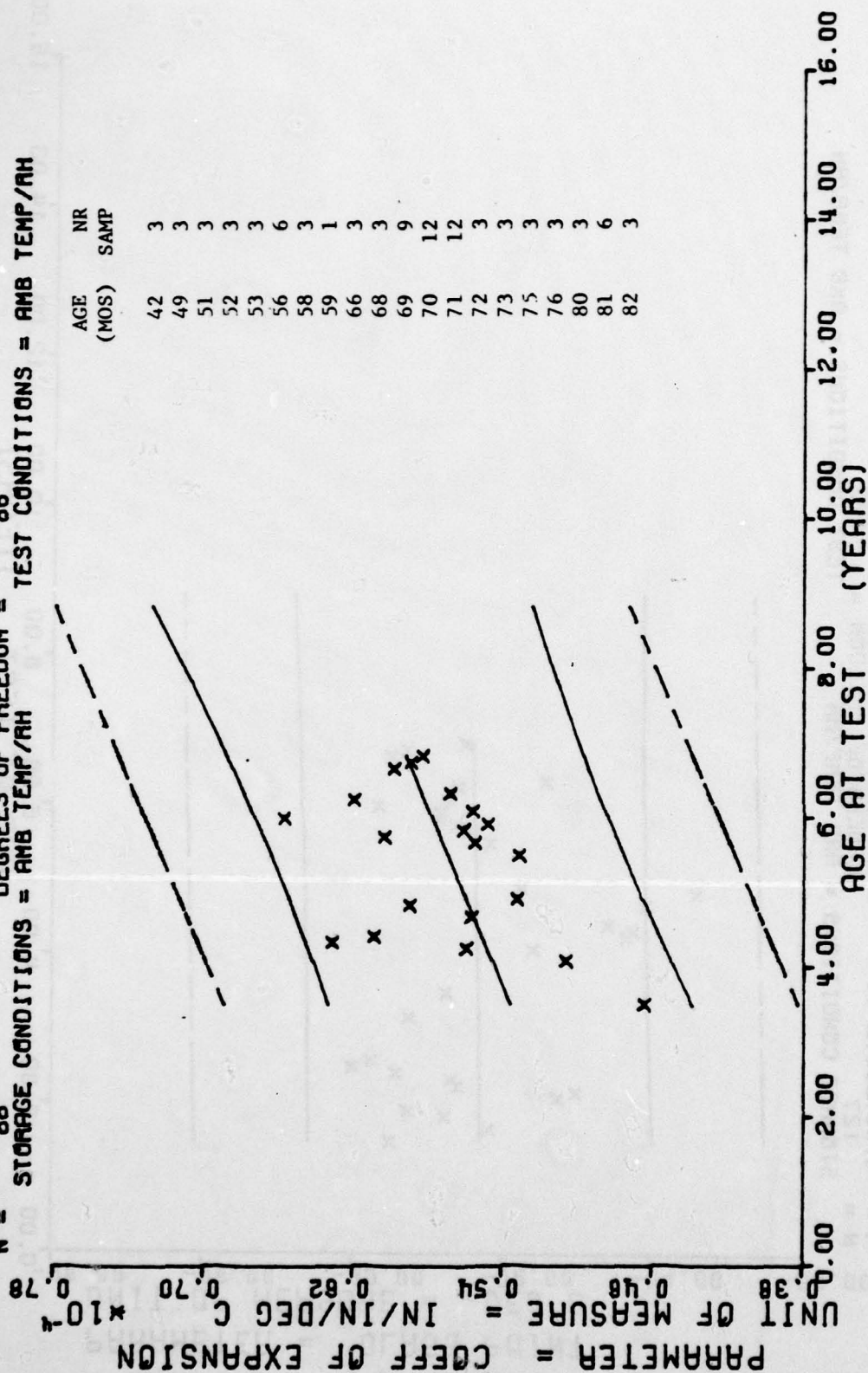


AMB 3066 PROPELLANT (ANA, G POLYMER) GLASS POINT UNLND CTNS

Figure 7-1



$F = +6.8449916E+00$  SIGNIFICANCE OF F = (+1.3916907E-07) \* X  
 $R = +2.7152337E-01$  SIGNIFICANCE OF R = SIGNIFICANT  
 $t = +2.6162934E+00$  SIGNIFICANCE OF t = SIGNIFICANT  
 $N = 88$  DEGREES OF FREEDOM = 86  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH



ANB 3066 PROPELLANT (ANA, G POLYMER) TCLE BELOW GLASS POINT, UNLND CTNS

Figure 7-2

$\gamma = ((+5.9510683E-05) + (+6.9652540E-07) \times X)$   
 $F = +1.8379800E+02$  SIGNIFICANCE OF F = SIGNIFICANT  $\sigma = +1.6895946E-05$   
 $R = +8.0760953E-01$  SIGNIFICANCE OF R = SIGNIFICANT  $S_e = +5.1376743E-08$   
 $t = +1.3557212E+01$  SIGNIFICANCE OF t = SIGNIFICANT  $S_t = +1.0014543E-05$   
 $N = 100$  DEGREES OF FREEDOM = 98  
 STORAGE CONDITIONS = AMB TEMP/AH TEST CONDITIONS = AMB TEMP/AH

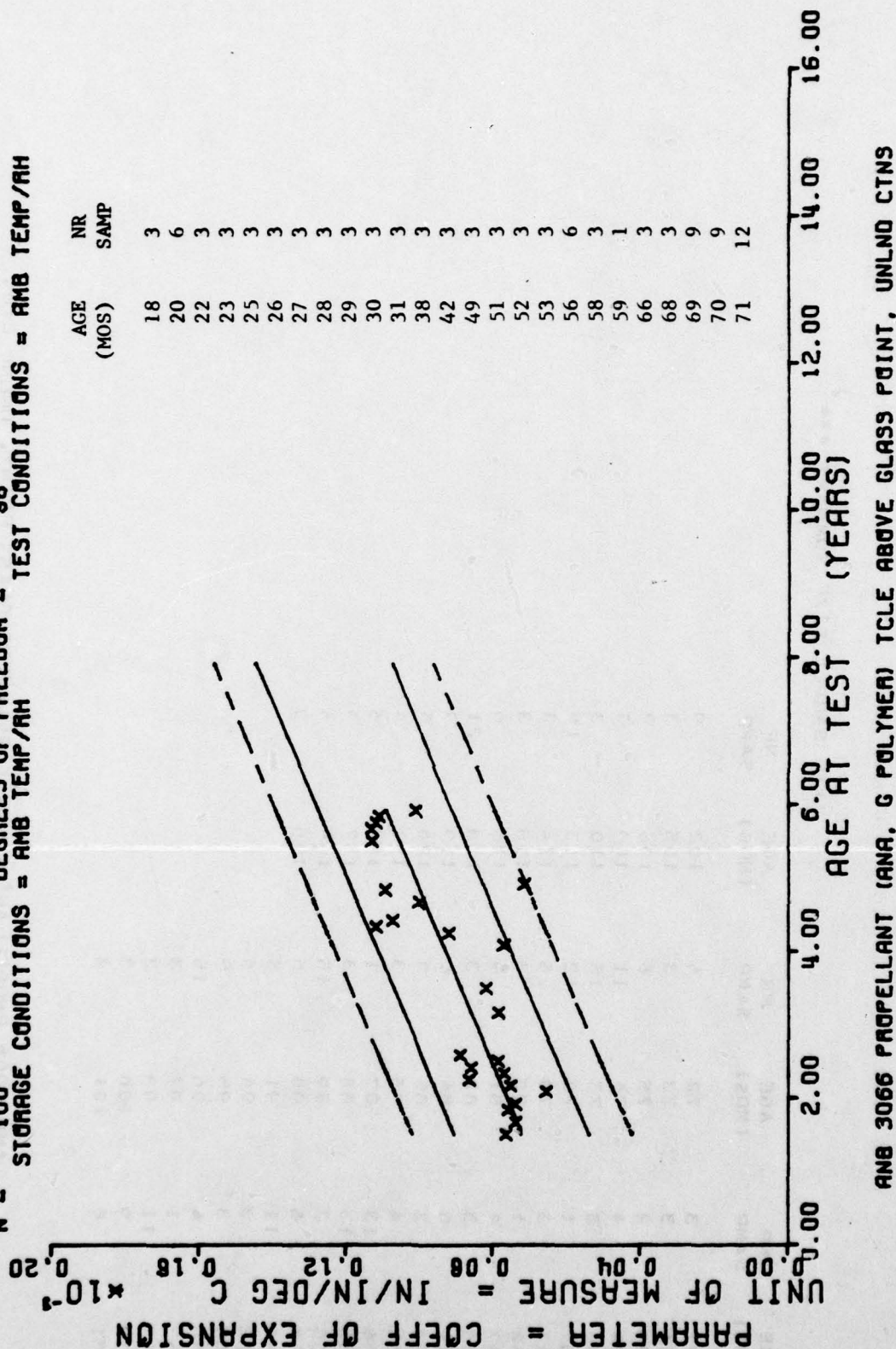


Figure 7-3

\*\*\* SAMPLE SIZE SUMMARY \*\*\*

AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP
27	3	72	6	102	9
31	3	73	3	105	3
33	2	75	6	106	2
34	4	76	11	107	5
35	3	77	15	110	3
37	1	78	12	113	19
41	3	79	6	114	3
42	1	80	3	115	3
47	4	81	9	116	6
49	3	82	3	118	21
49	6	84	8	119	3
50	3	85	7	120	5
53	4	86	3	121	4
54	13	87	1	122	6
55	13	88	3	137	9
55	3	89	15	144	5
60	6	90	6	146	3
61	11	91	6		
62	3	94	6		
63	3	95	9		
65	4	96	15		
67	1	97	3		
69	11	98	3		
70	2	100	3		
71	6	101	3		

ANR 3066 PROPELLANT (ANR, C POLYMER) GLASS POINT, UNLND CTNS

This sample size summary is applicable to figure 7-4



$F = +2.6038921E+01$  SIGNIFICANCE OF F = SIGNIFICANT  $\sigma_r = +3.5623656E+00$   
 $R = -2.4353421E-01$  SIGNIFICANCE OF R = SIGNIFICANT  $S_e = +6.4684903E-03$   
 $t = +5.1028346E+00$  SIGNIFICANCE OF t = SIGNIFICANT  $S_t = +3.4592914E+00$   
 $N = 415$  DEGREES OF FREEDOM = 413  
 STORAGE CONDITIONS = AMB TEMP/AH TEST CONDITIONS = AMB TEMP/AH

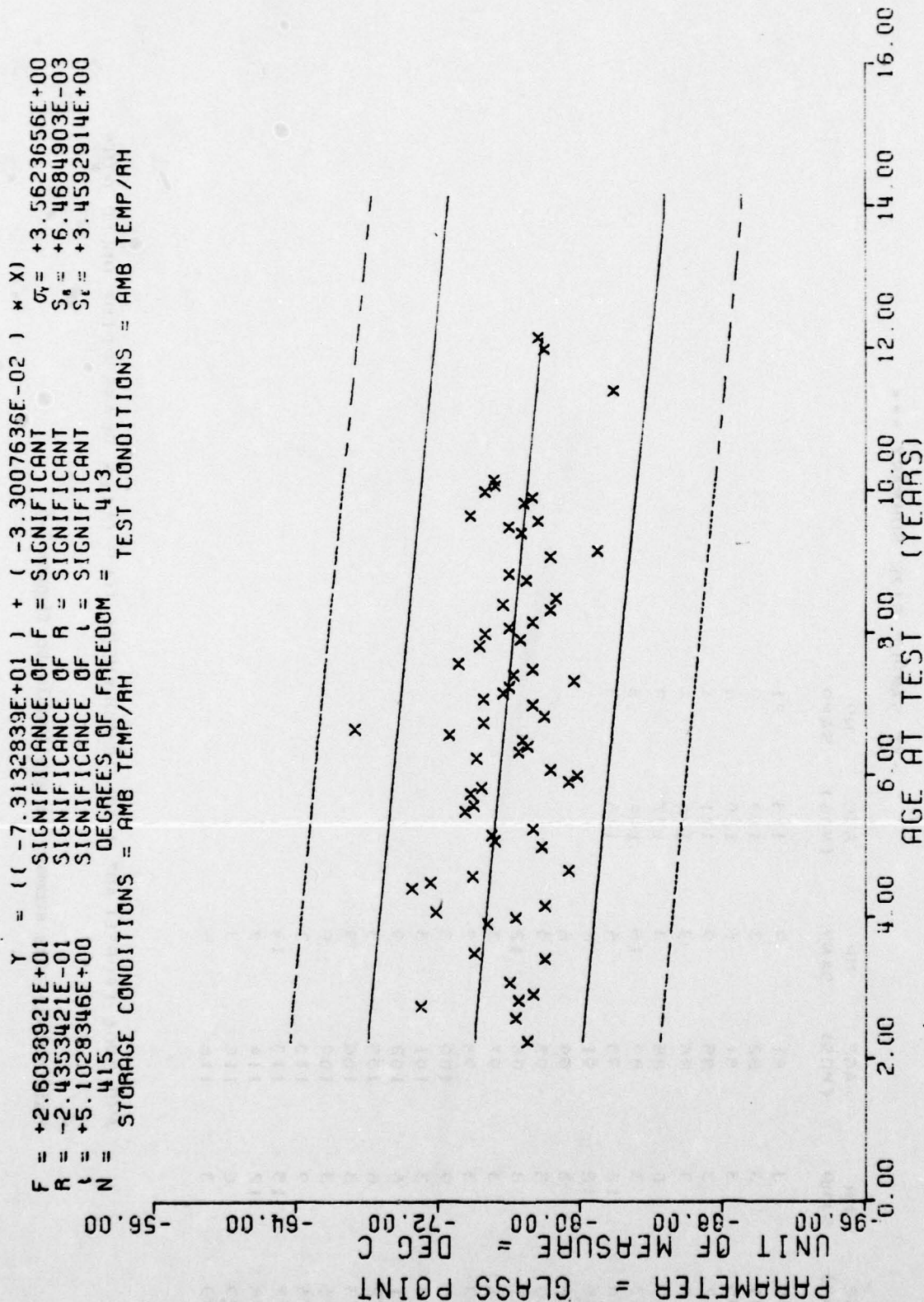


Figure 7 -4

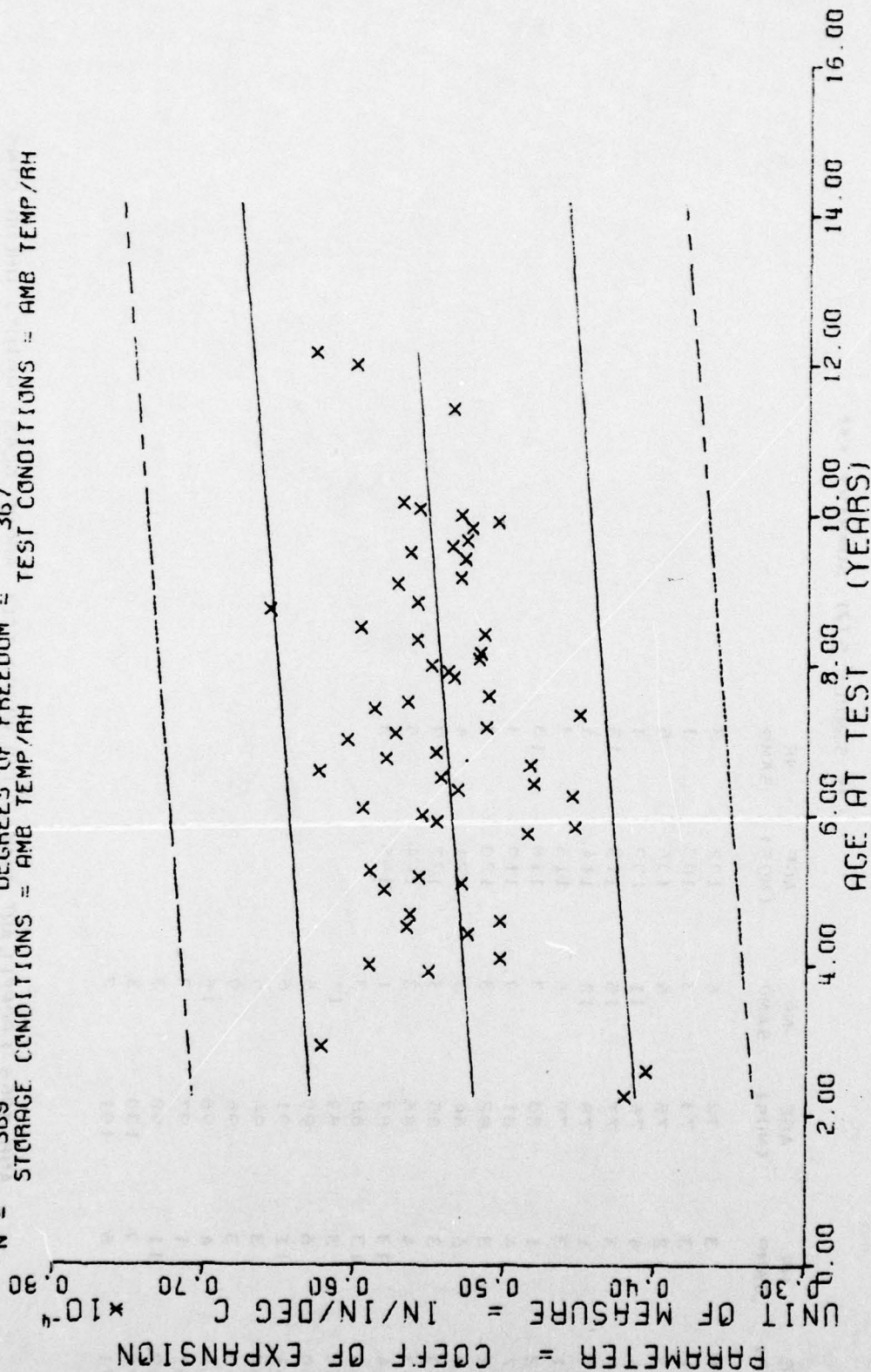
\*\*\* SAMPLE SIZE SUMMARY \*\*\*

AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP
27	3	81	9	113	21
31	3	82	3	113	9
35	3	84	6	120	9
47	3	85	3	121	4
48	3	86	3	122	5
49	6	88	3	137	3
53	3	89	15	144	5
54	12	90	6	145	3
55	12	91	6		
56	3	94	6		
60	3	95	3		
61	8	96	12		
62	3	97	3		
63	3	98	3		
69	9	100	3		
70	3	101	3		
71	6	102	9		
72	6	105	3		
73	3	106	9		
75	3	109	9		
76	9	110	3		
77	15	113	13		
78	12	114	3		
79	6	115	3		
90	3	116	6		

AND 3066 PROPELLANT (AUP, 6 POLYMER) TOLE BELOW GLASS POINT UNIND CTNS

This sample size summary is applicable to figure 7-5

$Y = ((+5.1203056E-05) + (+3.3159963E-08) * X)$   
 $F = +6.7197867E+00$  SIGNIFICANCE OF F = SIGNIFICANT  $\sigma_e = +6.2793422E-06$   
 $R = +1.3409256E-01$  SIGNIFICANCE OF R = SIGNIFICANT  $S_n = +1.2791936E-08$   
 $t = +2.5922551E+00$  SIGNIFICANCE OF t = SIGNIFICANT  $S_t = +6.2307073E-06$   
 $N = 369$  DEGREES OF FREEDOM = 367  
 STORAGE CONDITIONS = AMB TEMP/9H TEST CONDITIONS = AMB TEMP/9H



ANB 3066 PROPELLANT (ANB, G POLYMER) TCLE BELOW GLASS POINT UNLND CTNS

Figure 7-5



\*\*\* SAMPLE SIZE SUMMARY \*\*\*

AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP
27	3	72	6	102	3
31	3	73	3	105	3
33	2	75	6	106	6
34	4	76	11	107	3
35	3	77	15	113	15
37	1	78	12	114	3
41	3	79	6	115	3
42	1	80	3	119	13
47	4	81	3	119	3
48	3	82	3	120	3
49	6	84	3	121	4
50	3	85	3	137	9
53	4	86	3	144	5
54	13	87	1	145	3
55	13	88	3		
55	3	89	15		
59	6	90	5		
61	11	91	6		
62	3	94	6		
63	3	95	9		
66	4	96	15		
67	1	97	3		
69	11	98	3		
70	3	100	3		
71	5	101	3		

ANR 3066 PROPRIETANT (ANR 6 POLYMER) TOLU ABOVE GLASS POINT, UNHID CTNS

This sample size summary is applicable to figure 7-6

$Y = ((+8.3964133E-05) + (+5.0976943E-03) * X)$   
 $F = +2.3048118E+00$  SIGNIFICANCE OF F = NOT SIGNIFICANT  $S_0 = +1.6708653E-05$   
 $R = +7.9869481E-02$  SIGNIFICANCE OF R = NOT SIGNIFICANT  $S_1 = +3.3578094E-08$   
 $t = +1.5181606E+00$  SIGNIFICANCE OF t = NOT SIGNIFICANT  $S_2 = +1.6678455E-05$   
 $N = 361$  DEGREES OF FREEDOM = 359  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH

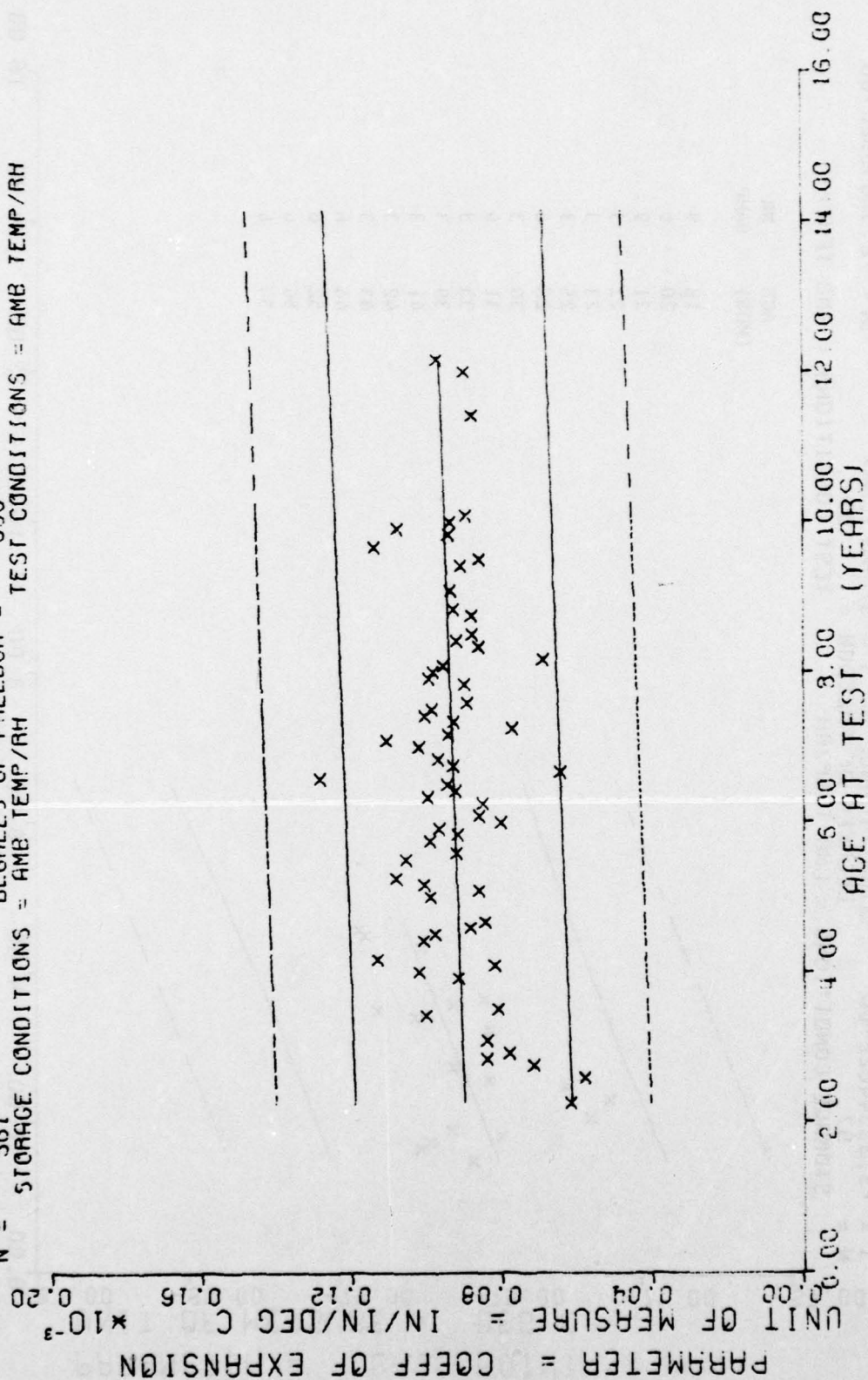
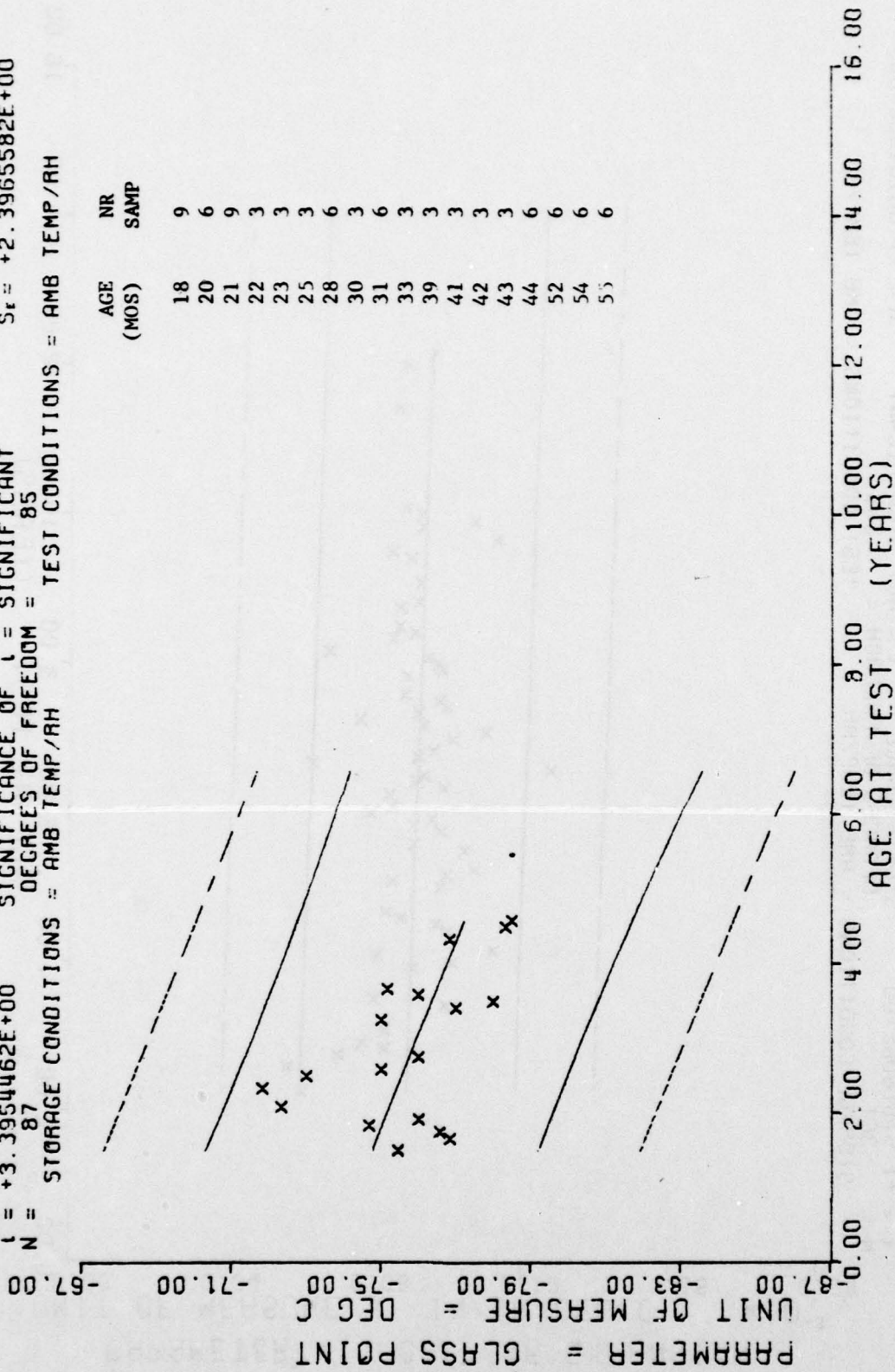


Figure 7-6

$Y = ((-7.3545281E+01) + (-6.7331482E-02) \times X)$   
 $F = +1.1529055E+01$  SIGNIFICANCE OF F = SIGNIFICANT  $G_r = +2.5390297E+00$   
 $R = -3.4559530E-01$  SIGNIFICANCE OF R = SIGNIFICANT  $S_b = +1.9829935E-02$   
 $l = +3.3954462E+00$  SIGNIFICANCE OF l = SIGNIFICANT  $S_r = +2.3965582E+00$   
 $N = 87$  DEGREES OF FREEDOM = 85  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH

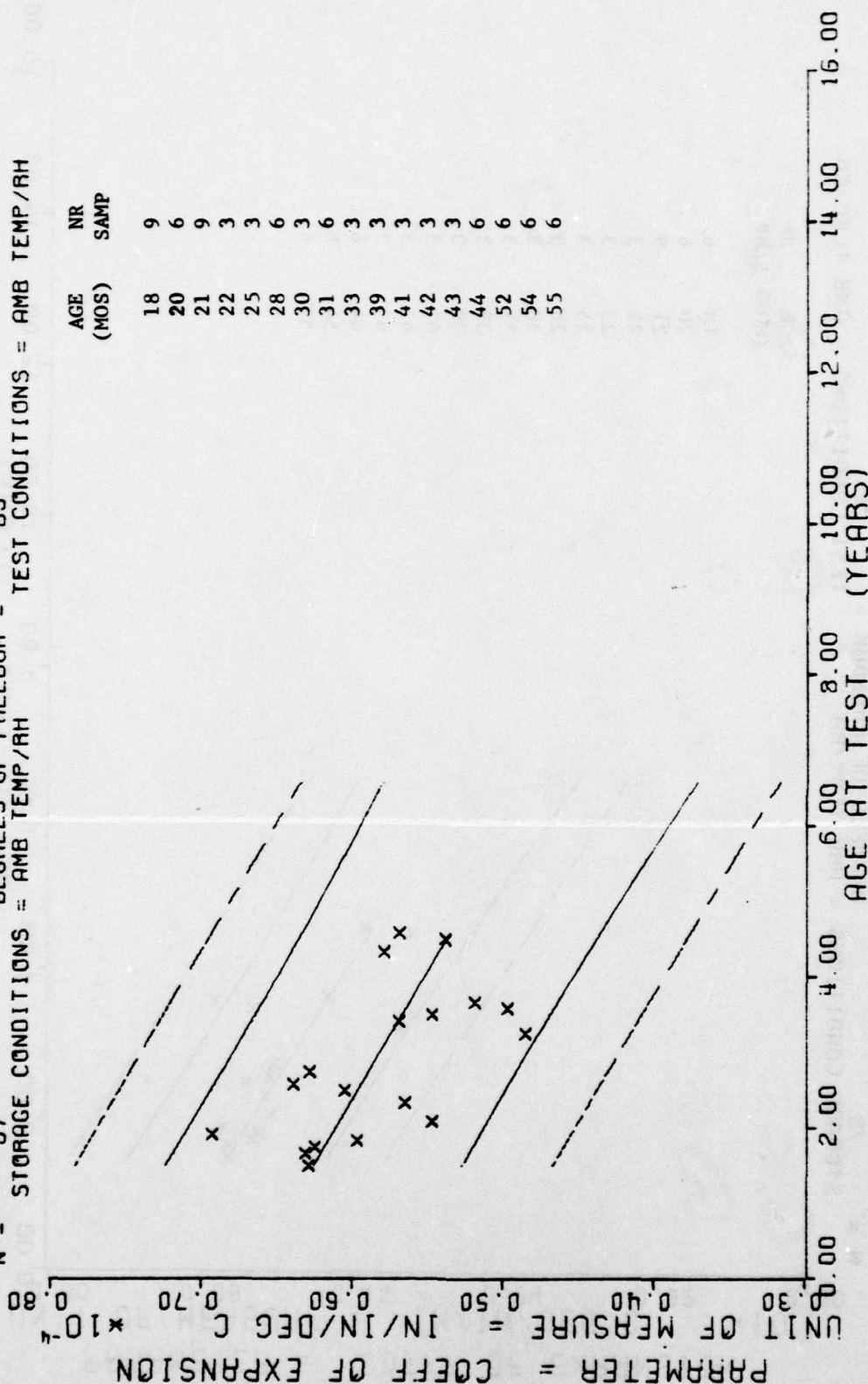


ANB 3066 PROPELLANT (ANB C POLYMER) GLASS POINT, LINED CARTONS

Figure 7-7



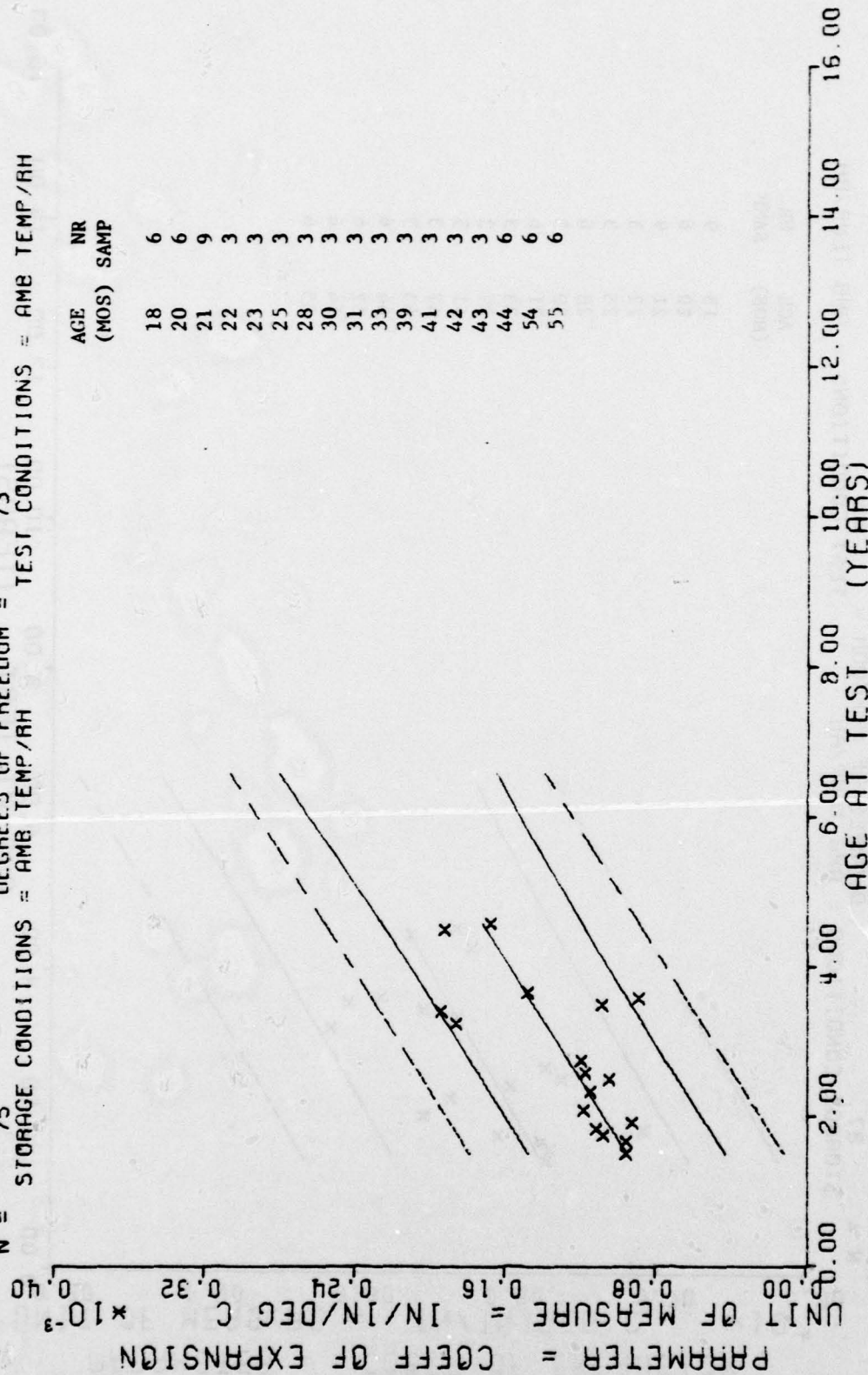
$Y = ((+6.7012301E-05) + (-2.4631069E-07) * X)$   
 $F = +3.1611985E+01$  SIGNIFICANCE OF F = SIGNIFICANT  $\sigma_r = +6.1651895E-06$   
 $R = -5.2066009E-01$  SIGNIFICANCE OF R = SIGNIFICANT  $S_e = +4.3808399E-08$   
 $I = +5.6224536E+00$  SIGNIFICANCE OF I = SIGNIFICANT  $S_t = +5.2944891E-06$   
 $N = 87$  DEGREES OF FREEDOM = 85  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH



ANB 3066 PROPELLANT (ANB G POLYMER) TCLE BELOW GLASS POINT, LINED CARTONS

Figure 7-8

$F = +5.1832892E+01$  SIGNIFICANCE OF F = SIGNIFICANT  $\sigma_r = +3.6306901E-05$   
 $R = +6.4437429E-01$  SIGNIFICANCE OF R = SIGNIFICANT  $S_e = +2.8875159E-07$   
 $t = +7.1995063E+00$  SIGNIFICANCE OF t = SIGNIFICANT  $S_t = +2.7953779E-05$   
 $N = 75$  DEGREES OF FREEDOM = 73  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH



ANB 3066 PROPELLANT (ANB G POLYMER) TCLE ABOVE GLASS POINT, LINED CARTONS

Figure 7-9

\*\*\* SAMPLE SIZE SUMMARY \*\*\*

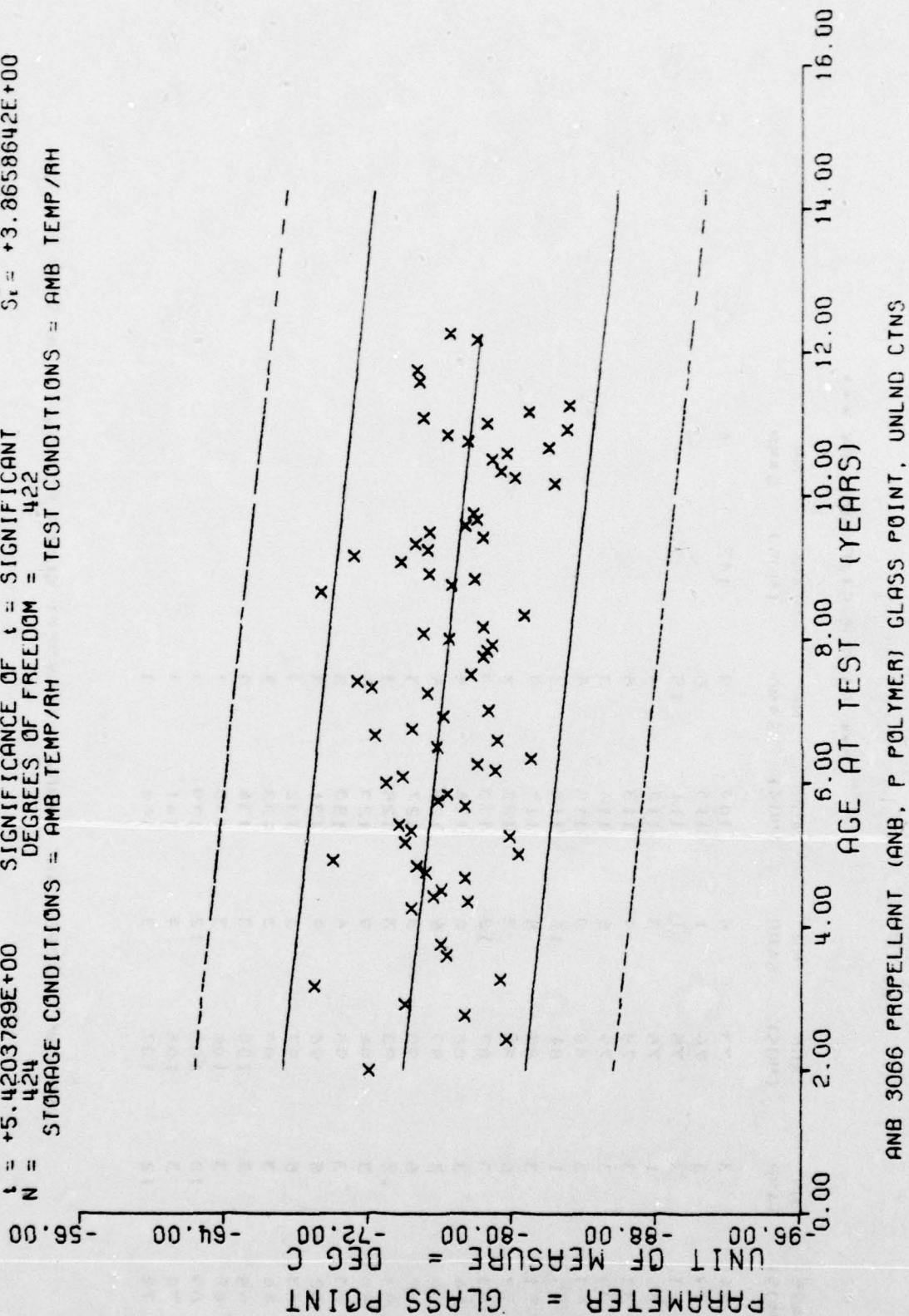
AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP
24	3	73	6	109	9	147	6
29	3	74	1	110	6		
33	3	75	1	111	15		
35	1	76	3	112	9		
39	3	78	9	113	6		
39	3	79	6	114	3		
43	3	80	9	115	5		
45	1	81	15	116	3		
51	3	83	9	117	9		
52	6	84	3	122	3		
53	9	87	12	123	9		
54	3	88	6	124	5		
56	3	89	6	126	5		
57	6	90	3	127	3		
59	12	93	3	128	3		
60	3	94	9	129	6		
62	6	95	6	130	3		
63	6	96	9	131	3		
64	3	97	3	132	9		
65	3	99	3	133	3		
68	3	100	3	134	9		
69	10	104	3	135	9		
70	3	105	12	139	9		
72	12	106	9	141	3		
		107	3	146	3		

ANR 3045 PROPELLANT (ANR. B POLYMER) GLASS POINT, UNIND CTDS

This sample size summary is applicable to figure 7-10



$F = +2.9380508E+01$  SIGNIFICANCE OF  $F = (-3.5081801E-02) \times X$   
 $R = -2.5512807E-01$  SIGNIFICANT  
 $t = +5.4203789E+00$  SIGNIFICANT  
 $N = 424$  DEGREES OF FREEDOM = 422  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH



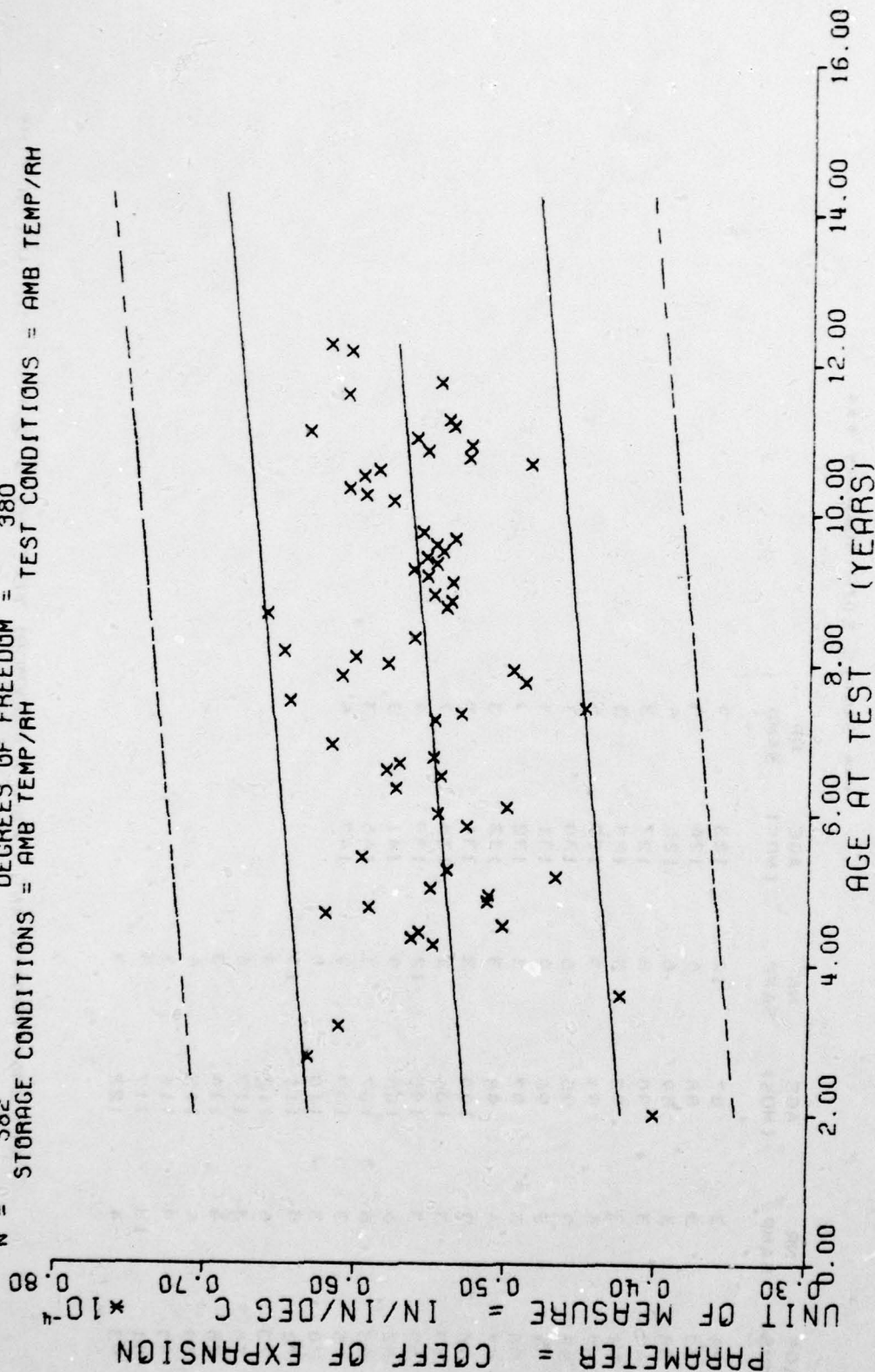
\*\*\* SAMPLE SIZE SUMMARY \*\*\*

AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP
24	3	87	12	123	3
33	3	88	6	124	6
38	3	89	6	126	6
43	3	90	3	127	3
51	3	93	3	129	3
52	6	94	9	129	6
53	9	95	6	130	3
54	3	96	9	131	3
56	3	97	3	132	9
57	6	98	3	133	3
58	9	100	3	134	9
59	3	104	3	135	3
60	3	105	12	139	9
62	6	106	9	141	3
63	6	107	3	146	3
65	3	109	9	147	6
70	3	110	6		
72	9	111	15		
73	6	112	3		
76	3	113	6		
78	6	114	3		
79	6	115	6		
80	9	116	3		
81	15	117	9		
83	4	122	3		

ANR 3066 PROPELLANT (ANR, P POLYMER) TCLE BELOW GLASS POINT UPRID CTNS

This sample size summary is applicable to figure 7-11

$F = +1.3206153E+01$  SIGNIFICANCE OF F = (+3.9346807E-08) \* X)  
 $R = +1.8326436E-01$  SIGNIFICANCE OF R = SIGNIFICANT  
 $t = +3.6340271E+00$  SIGNIFICANCE OF t = SIGNIFICANT  
 $N = 382$  DEGREES OF FREEDOM = 380  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH



ANB 3066 PROPELLANT (ANB, P POLYMER) TCLE BELOW GLASS POINT UNLND CTNS

Figure 7-11



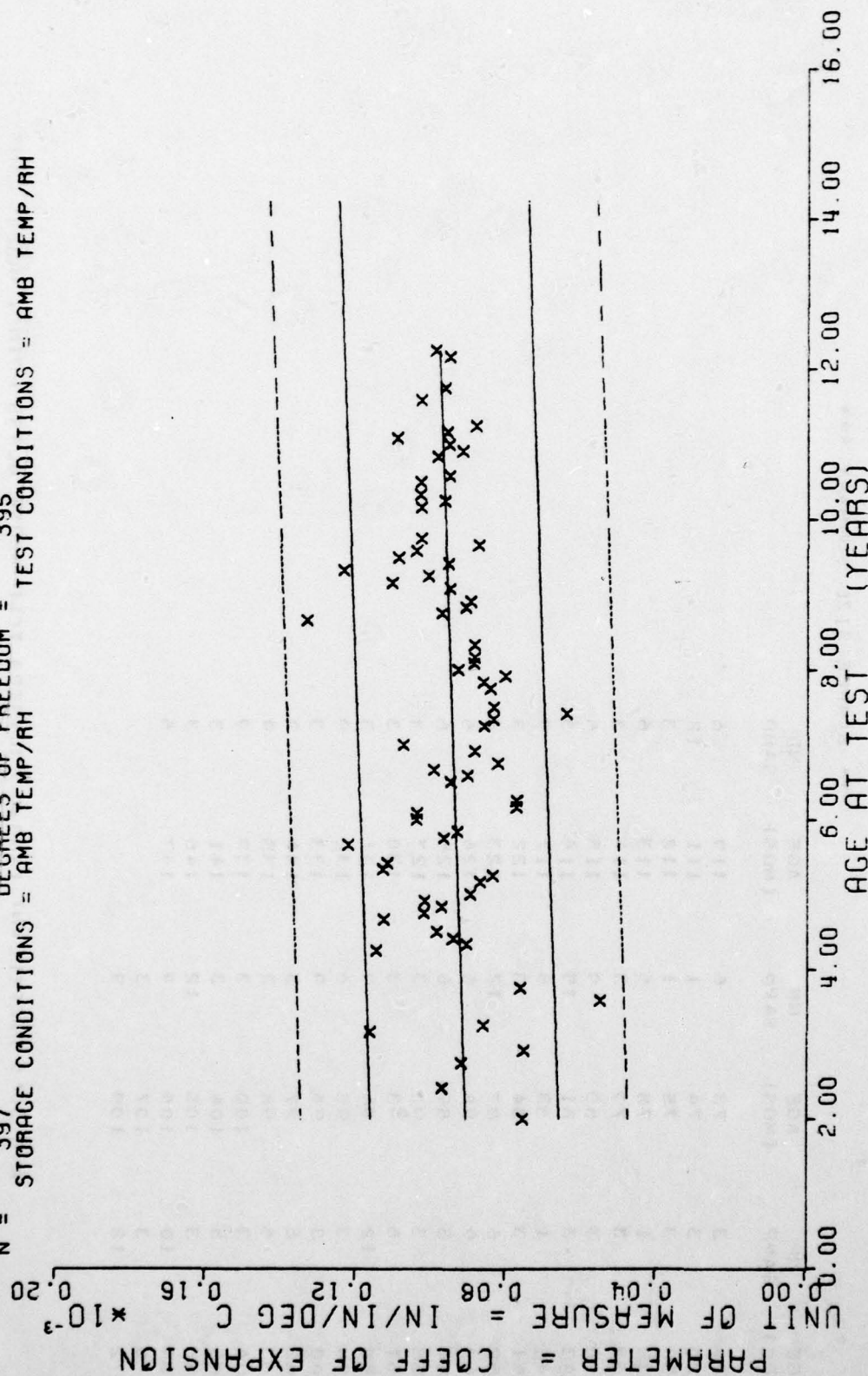
\*\*\* SAMPLE SIZE SUMMARY \*\*\*

AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP
24	3	73	6	110	6
29	3	74	1	111	12
33	3	75	1	112	3
35	1	78	6	113	6
39	3	73	3	114	3
39	3	80	9	115	6
43	3	81	15	116	3
45	1	93	8	117	9
51	3	84	3	122	3
52	6	87	12	123	3
53	9	88	5	124	5
54	3	89	6	126	6
56	3	90	3	127	3
57	3	93	3	130	3
59	12	94	9	131	3
59	3	95	6	132	9
60	3	96	9	133	3
62	6	97	3	134	9
63	6	98	3	135	9
64	3	100	3	139	3
65	3	104	3	141	3
68	3	105	12	146	3
69	10	106	9	147	6
70	3	107	3		
72	12	109	9		

ANB 30% PROPELLANT (ANR.P POLYMER) TOLF ABOVE GLASS POINT, UNLID CTNS

This sample size summary is applicable to figure 7-12

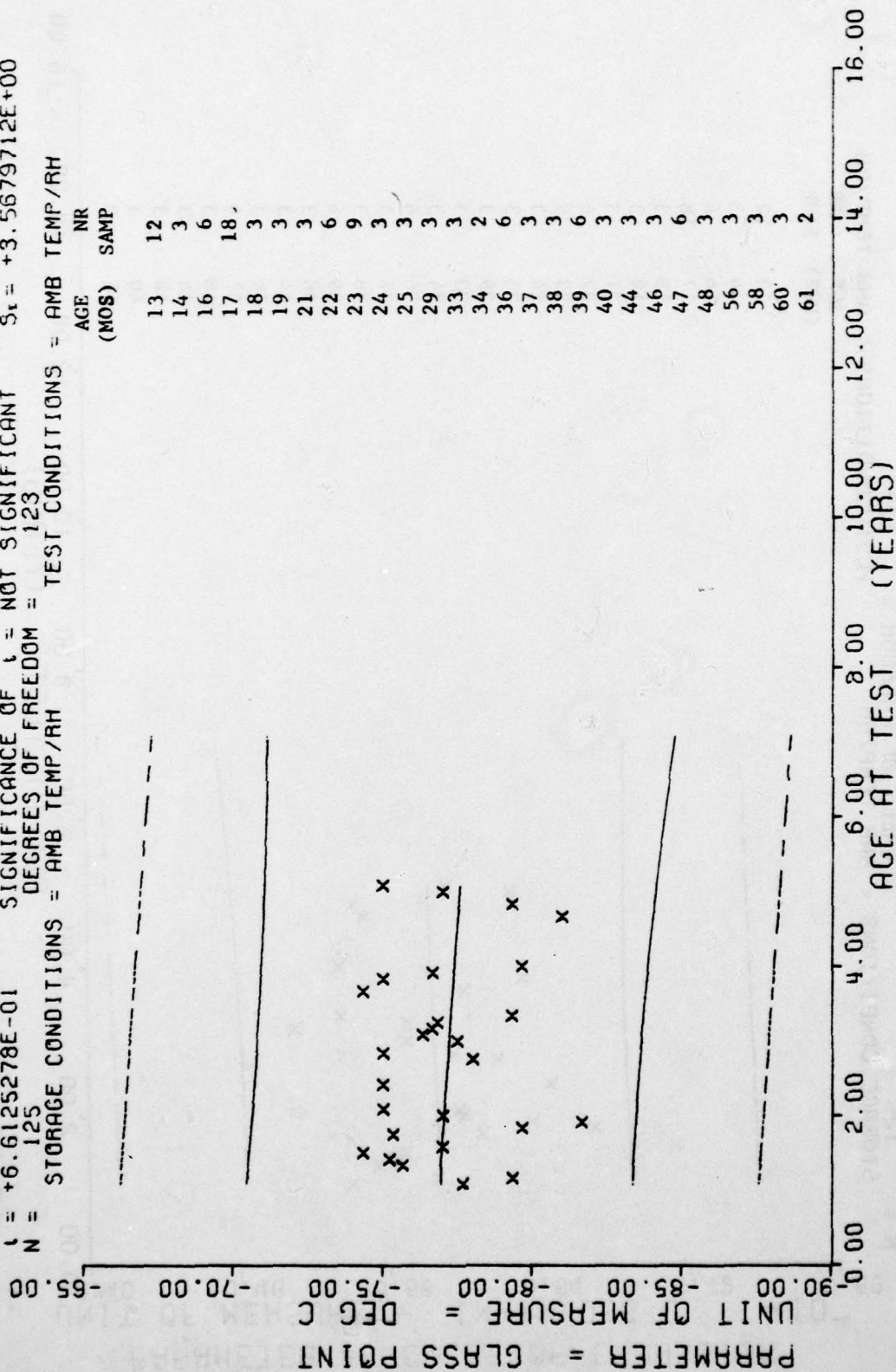
$Y = ((+8.9527950E-05) + (+5.7186773E-08) \times X)$   
 $F = +5.2140881E+00$  SIGNIFICANCE OF F = SIGNIFICANT  $\sigma_r = +1.4685048E-05$   
 $R = +1.1414134E-01$  SIGNIFICANCE OF R = SIGNIFICANT  $S_e = +2.5044156E-08$   
 $t = +2.2834377E+00$  SIGNIFICANCE OF t = SIGNIFICANT  $S_t = +1.4607530E-05$   
 $N = 397$  DEGREES OF FREEDOM = 395  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH



AMB 3066 PROPELLANT (AMB, P OLYMER) TCLE ABOVE GLASS POINT, UNLND CTNS

Figure 7-12

$Y = ((-7.6703880E+01) + (-1.4937534E-02) \times X)$   
 $F = +4.3725524E-01$  SIGNIFICANCE OF F = NOT SIGNIFICANT  $G_r = +3.5598658E+00$   
 $R = -5.9517459E-02$  SIGNIFICANCE OF R = NOT SIGNIFICANT  $S_o = +2.2589749E-02$   
 $t = +6.6125278E-01$  SIGNIFICANCE OF t = NOT SIGNIFICANT  $S_t = +3.5679712E+00$   
 $N = 125$  DEGREES OF FREEDOM = 123  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH

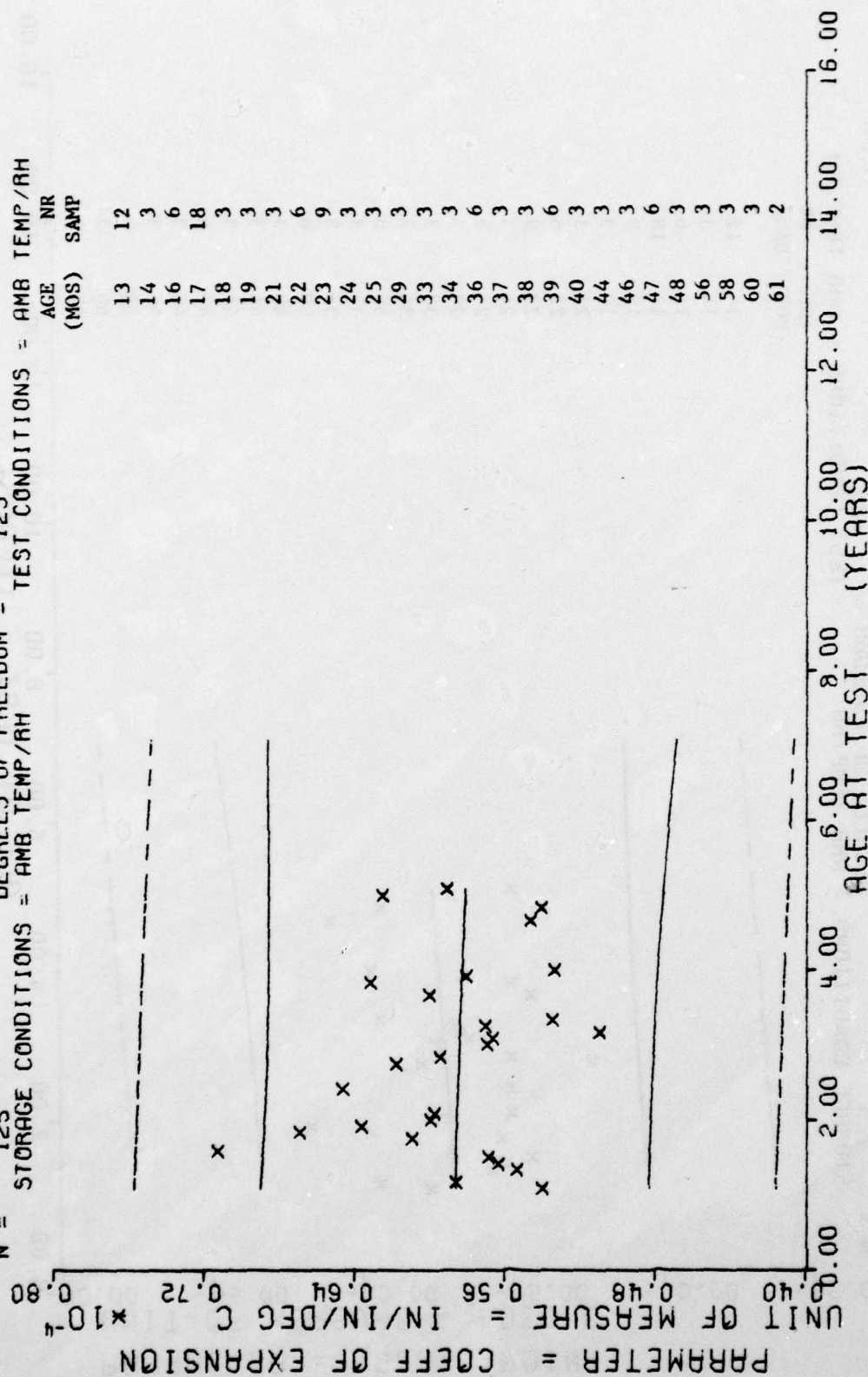


ANB 3066 PROPELLANT (ANB P POLYMER) GLASS POINT, LINED CARTONS

Figure 7-13

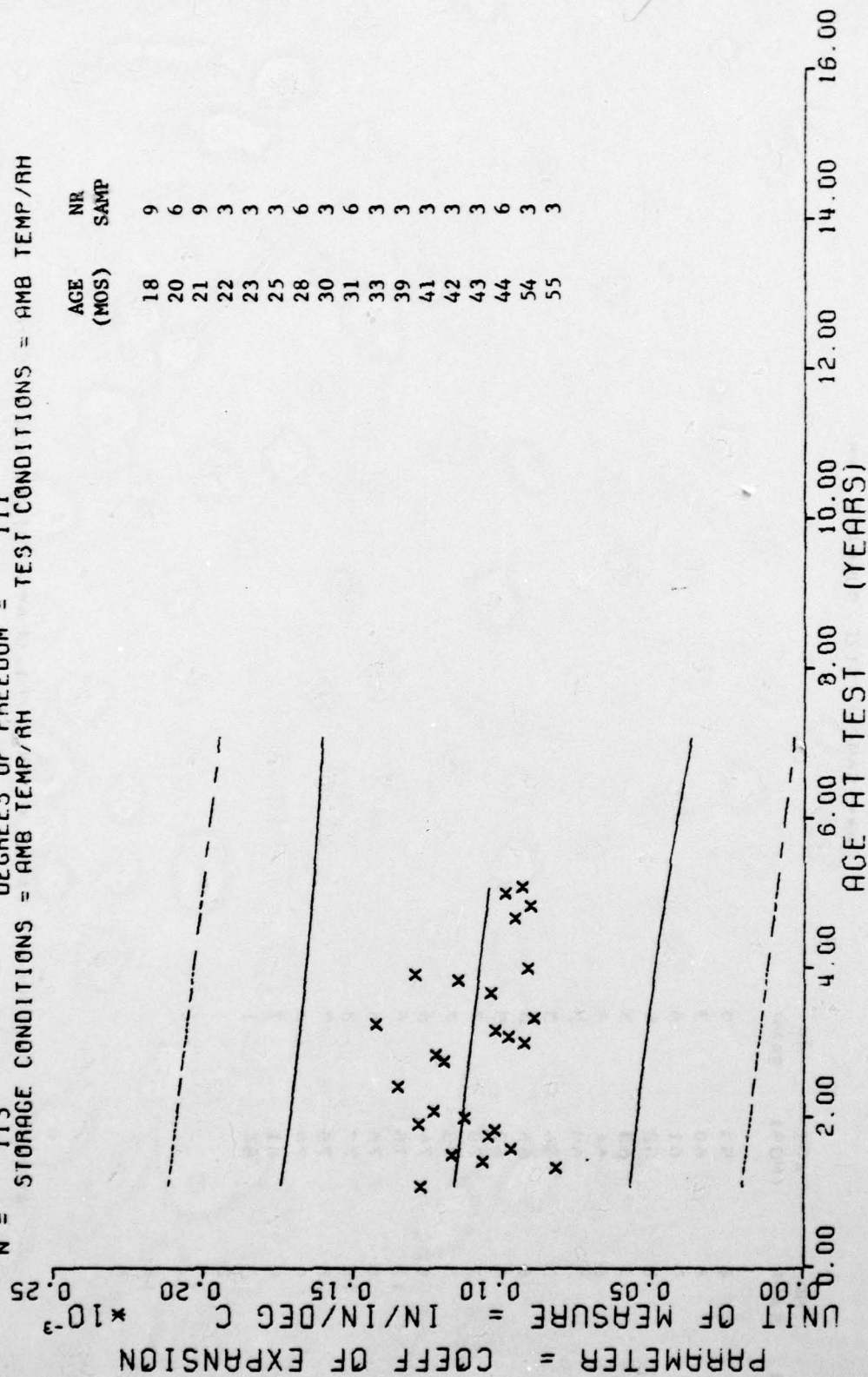


$F = +1.3916152E-01$   
 $R = -3.3617196E-02$   
 $t = +3.7304359E-01$   
 $N = 125$   
 $Y = ((+5.8830876E-05) + (-1.3456287E-08) \times X)$   
 SIGNIFICANCE OF F = NOT SIGNIFICANT  
 SIGNIFICANCE OF R = NOT SIGNIFICANT  
 SIGNIFICANCE OF t = NOT SIGNIFICANT  
 DEGREES OF FREEDOM = 123  
 STORAGE CONDITIONS = AMB TEMP/RH  
 TEST CONDITIONS = AMB TEMP/RH



ANB 3066 PROPELLANT (ANB P POLYMER) TCLE BELOW GLASS POINT, LINED CARTONS

$Y = ((+1.1904795E-04) + (-2.3911472E-07) * X)$   
 F = +1.2387268E+00 SIGNIFICANCE OF F = NOT SIGNIFICANT  $\alpha = +3.2001453E-05$   
 R = -1.0505492E-01 SIGNIFICANCE OF R = NOT SIGNIFICANT  $S_a = +2.1484168E-07$   
 t = +1.1129810E+00 SIGNIFICANCE OF t = NOT SIGNIFICANT  $S_r = +3.1967402E-05$   
 N = 113 DEGREES OF FREEDOM = 111  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH



ANB 3066 PROPELLANT (ANB P POLYMER) TCLE ABOVE GLASS POINT, LINED CARTONS

Figure 7-15

\*\*\* SAMPLE SIZE SUMMARY \*\*\*

AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP
15	6	53	9
26	6	60	3
27	9	61	6
29	3	62	6
30	3	63	3
31	6	64	9
32	3	65	3
33	3	66	3
37	6	68	3
38	6	69	5
39	3	70	7
41	3	73	7
43	5	74	6
44	12	75	6
46	6	76	6
47	12	77	3
49	6	78	7
49	9	79	6
50	9	81	7
51	3	84	1
52	3		
53	15		
54	9		
56	12		
57	6		

ANH 3065 PROPELLANT (ANT. D POLYMER) GLASS POINT, UNLND CTS

This sample size summary is applicable to figures 7-16, 7-17 and 7-18





$F = +5.5514934E+00$  SIGNIFICANCE OF  $F =$  SIGNIFICANT  $\alpha = +5.3667988E-06$   
 $R = +1.3943133E-01$  SIGNIFICANCE OF  $R =$  SIGNIFICANT  $S_e = +2.3585237E-08$   
 $t = +2.3561480E+00$  SIGNIFICANCE OF  $t =$  SIGNIFICANT  $S_1 = +5.3238560E-06$   
 $N = 282$  DEGREES OF FREEDOM = 280  
 STORAGE CONDITIONS = AMB TEMP/AH TEST CONDITIONS = AMB TEMP/AH

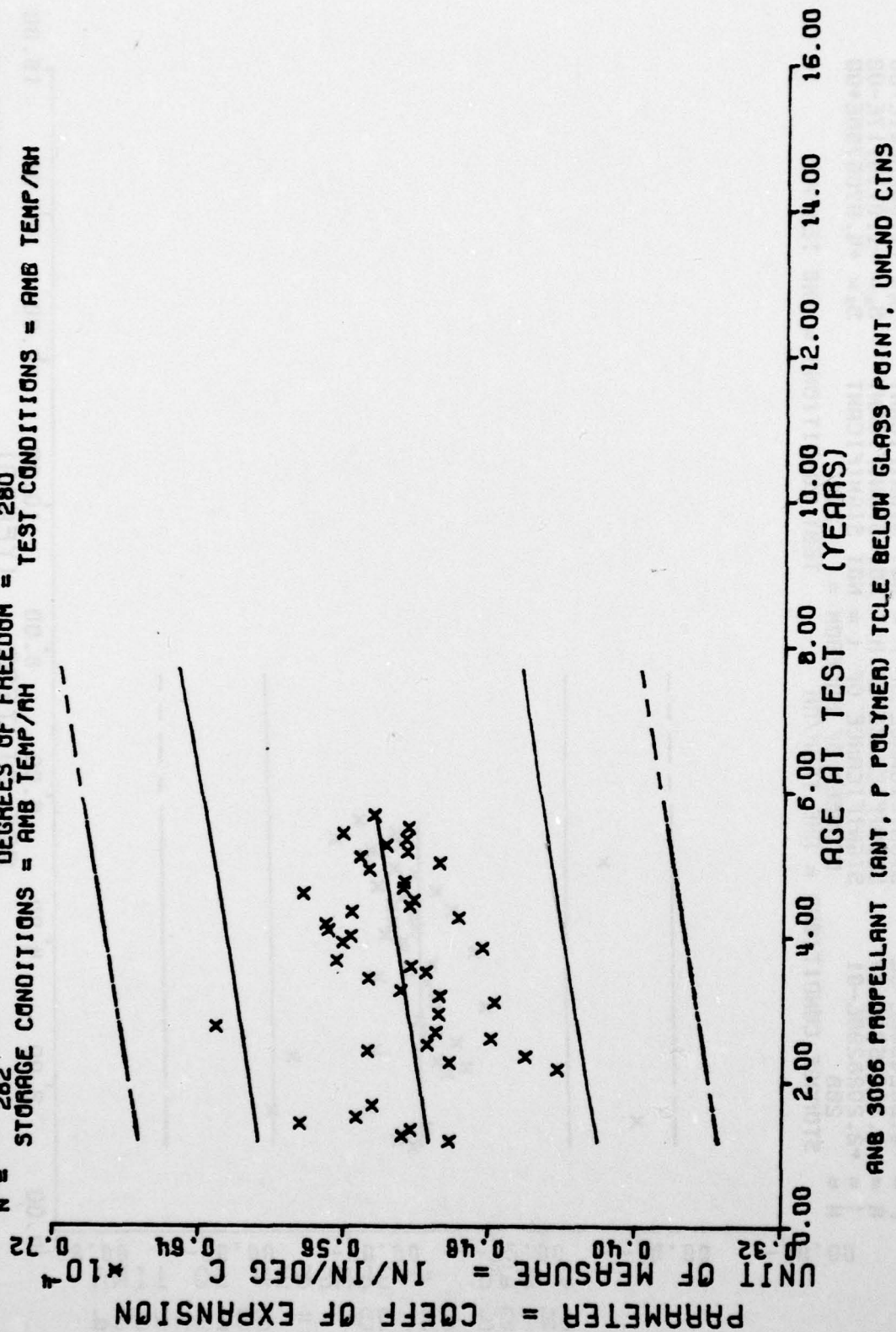
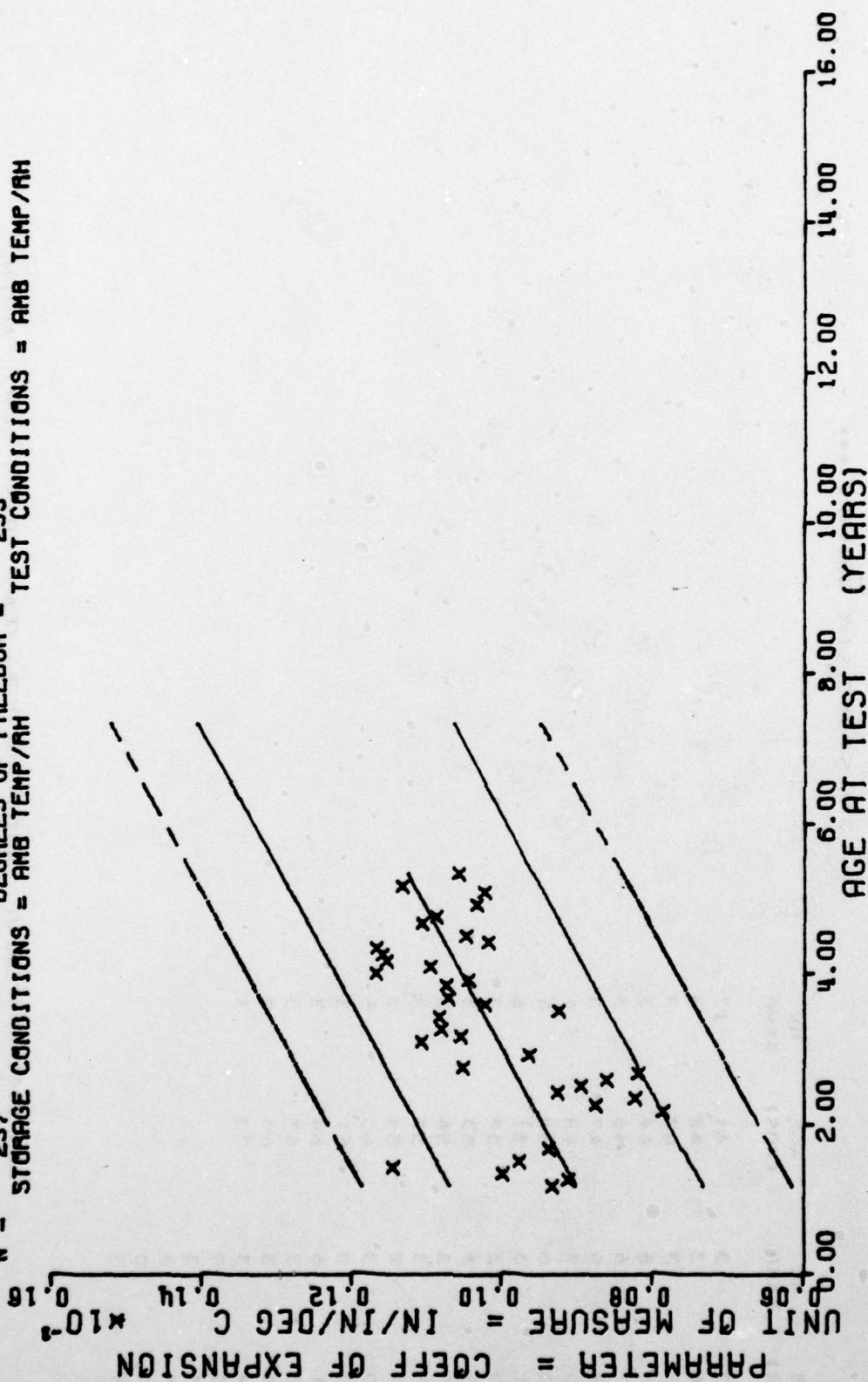


Figure 7-17

$Y = ((+8.3861754E-05) + (+4.4861427E-07) \times X)$   
 $F = +9.4589289E+01$  SIGNIFICANCE OF F = SIGNIFICANT  $\sigma = +1.1288976E-05$   
 $R = +5.3573596E-01$  SIGNIFICANCE OF R = SIGNIFICANT  $S_e = +4.6124231E-08$   
 $t = +8.7262166E+00$  SIGNIFICANCE OF t = SIGNIFICANT  $S_t = +9.5525083E-08$   
 $N = 237$  DEGREES OF FREEDOM = 235  
 STORAGE CONDITIONS = AMB TEMP/AH TEST CONDITIONS = AMB TEMP/AH



ANB 3066 PROPELLANT (ANT, P POLYMER) TCLE ABOVE GLASS POINT, UNLND CTNS

Figure 7-18



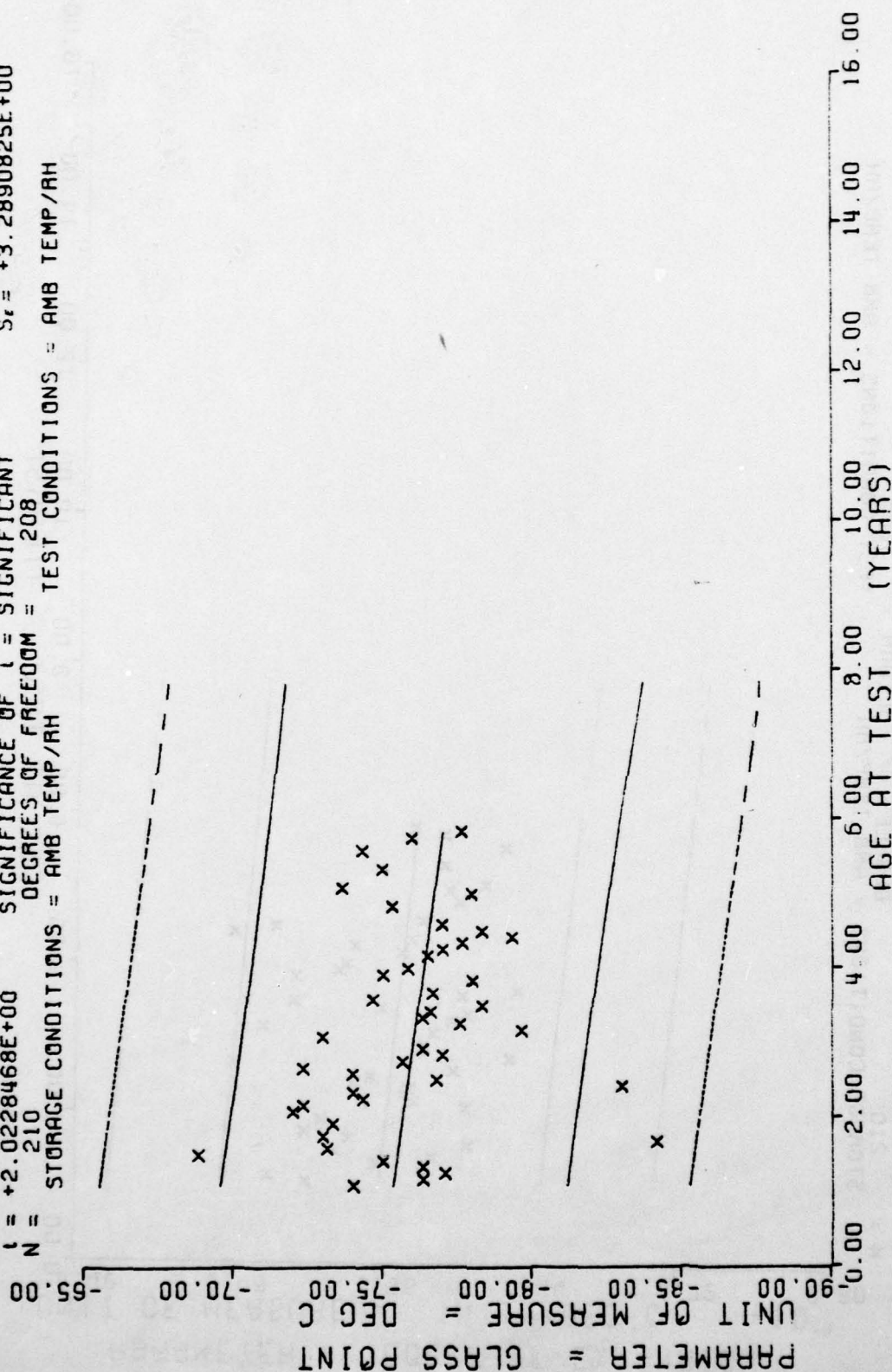
\*\*\* SAMPLE SIZE SUMMARY \*\*\*

AGE (MOs)	NR SAMP	AGE (MOs)	NR SAMP
13	3	41	12
14	3	42	3
15	13	43	3
16	6	44	3
17	6	46	3
18	6	47	3
19	7	48	6
20	6	50	6
21	3	51	6
23	3	52	3
25	3	53	3
26	3	54	3
27	3	55	3
28	7	58	3
29	3	60	6
30	10	61	3
31	6	64	3
32	3	67	3
33	3	69	3
34	3	70	3
35	9		
37	3		
38	3		
39	10		
40	3		

ANR 3066 PROPELLANT (ANT D POLYMER) GLASS POINT, LINEO CAPTIONS

This sample size summary is applicable to figures 7-19 and 7-20

$Y = ((-7.4973653E+01) + (-2.9889530E-02) \times X)$   
 $F = +4.0919094E+00$  SIGNIFICANCE OF F = ... SIGNIFICANT  
 $R = -1.3889958E-01$  SIGNIFICANCE OF R = ... SIGNIFICANT  
 $t = +2.0228468E+00$  SIGNIFICANCE OF t = ... SIGNIFICANT  
 $N = 210$  DEGREES OF FREEDOM = 208  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH



AMB 3066 PROPELLANT (ANT P POLYMER) GLASS POINT, LINED CARTONS

Figure 7-19

$Y = ((+5.5807951E-05) + (+3.2066267E-08) * X)$   
 $F = +2.1537907E+00$  SIGNIFICANCE OF F = NOT SIGNIFICANT  $G_1 = +4.8770903E-06$   
 $R = +1.0123557E-01$  SIGNIFICANCE OF R = NOT SIGNIFICANT  $S_0 = +2.1849759E-08$   
 $I = +1.4675793E+00$  SIGNIFICANCE OF I = NOT SIGNIFICANT  $S_1 = +4.8636838E-06$   
 $N = 210$  DEGREES OF FREEDOM = 208  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH

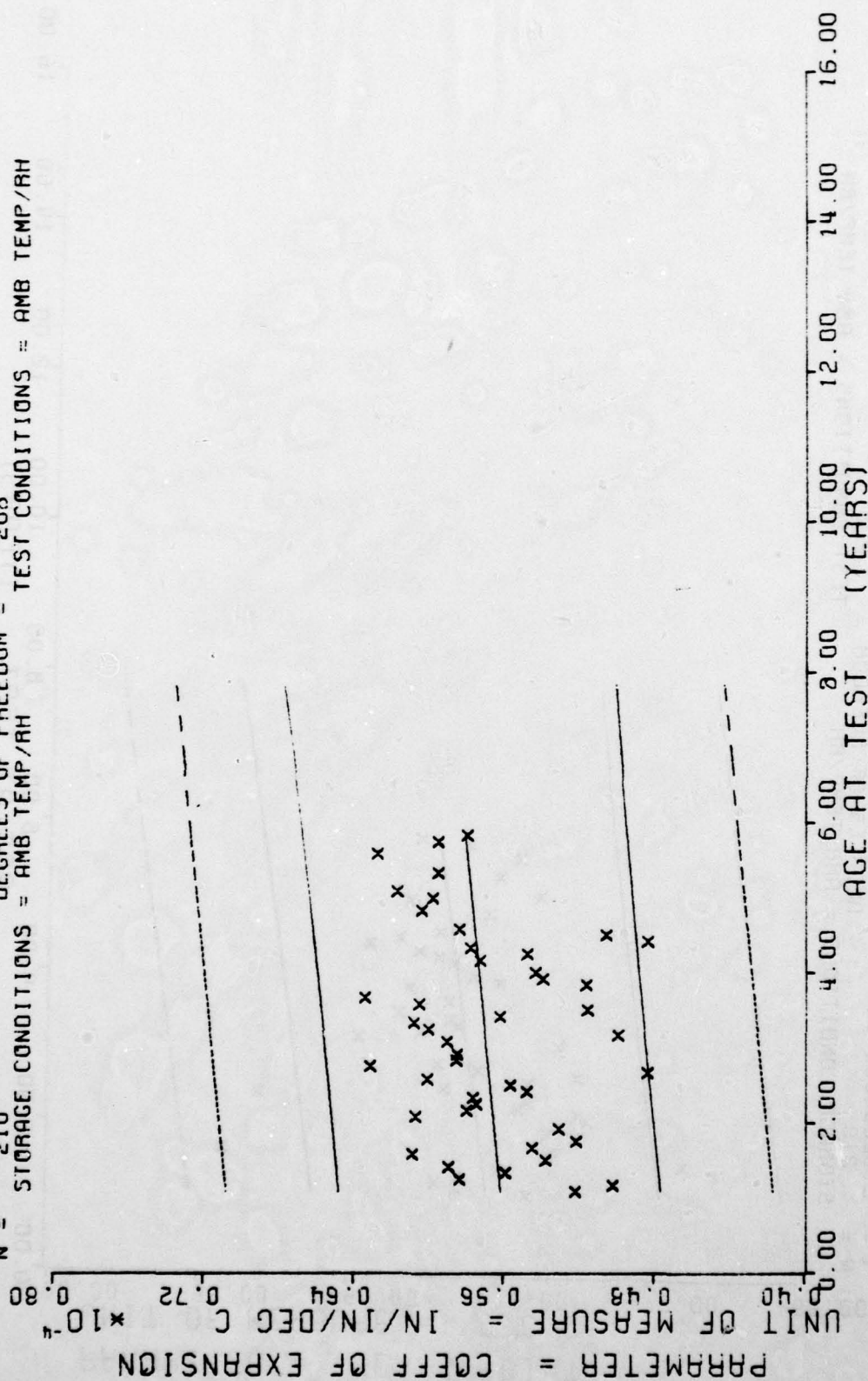


Figure 7-20



\*\*\* SAMPLE SIZE SUMMARY \*\*\*

AGE (MDS)	NR SAMP	AGE (MDS)	NR SAMP
13	3	41	13
14	3	42	3
15	13	43	3
16	6	44	3
17	6	48	3
18	6	50	6
19	7	51	3
20	6	58	3
21	3	60	6
23	3	61	3
25	3	64	3
26	3	67	3
27	3	69	3
29	7	70	3
29	3		
30	10		
31	6		
32	3		
33	3		
34	3		
35	3		
37	3		
38	3		
39	10		
40	3		

ANA 3066 PROPELLANT (ANT P POLYMER) TCLE ABOVE GLASS POINT, LINED CARTONS

This sample size summary is applicable to figure 7-21

AD-A080 581

OGDEN AIR LOGISTICS CENTER HILL AFB UT PROPELLANT LAB--ETC F/6 21/9.2  
PROPELLANT SURVEILLANCE REPORT ANB-3066 PROPELLANT.(U)  
NOV 79 E M DALABA

UNCLASSIFIED

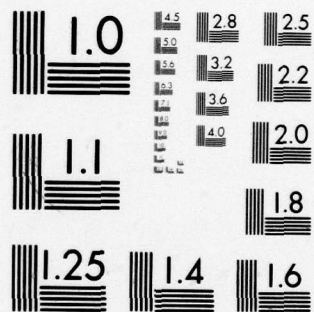
MANCP-417(79)

NL

4 OF 5

AD  
A080581

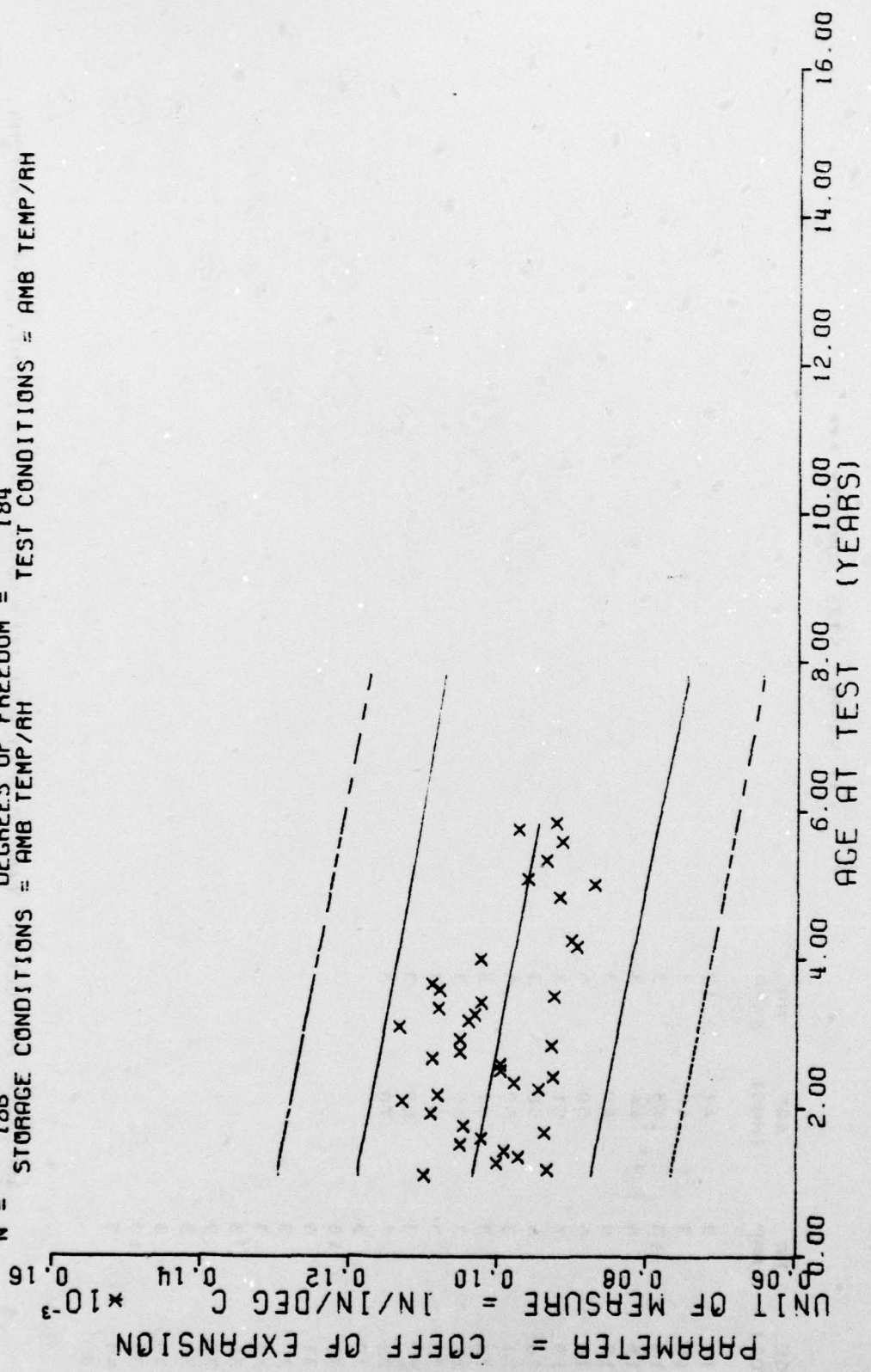




MICROCOPY RESOLUTION TEST CHART  
NATIONAL BUREAU OF STANDARDS-1963-A



$F = +1.3211731E+01$  SIGNIFICANCE OF  $F = (-1.5322842E-07) \times X$   $S_1 = +9.0765934E-06$   
 $R = -2.5882933E-01$  SIGNIFICANCE OF  $R =$  SIGNIFICANT  $S_2 = +4.2156005E-08$   
 $t = +3.6347946E+00$  SIGNIFICANCE OF  $t =$  SIGNIFICANT  $S_3 = +8.7910828E-06$   
 $N = 186$  DEGREES OF FREEDOM = 184  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH



ANB 3066 PROPELLANT (ANT P POLYMER) TCLE ABOVE GLASS POINT, LINED CARTONS

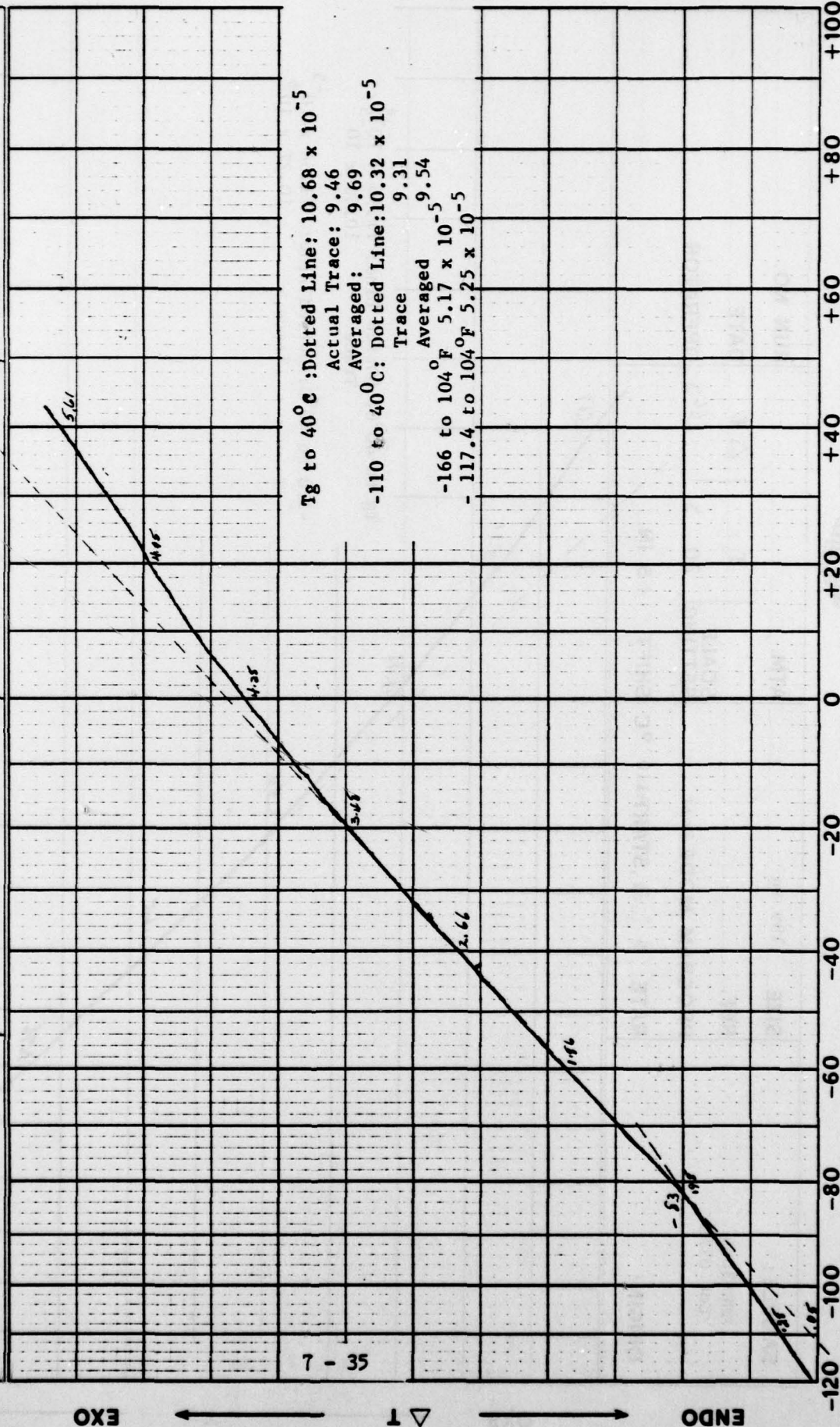
Figure 7-21

PART NO.900327



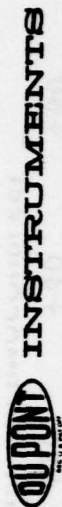
INSTRUMENTS

<b>SAMPLE:</b> ANR-3066 Lot 023P  <b>ORIGIN:</b>	SIZE 199 in	ATM.	RUN NO.	
	REF.	T	$\Delta T$	DATE
	PROGRAM MODE Heat	SCALE SETTING 20 $\frac{^\circ}{in}$	OPERATOR	
	RATE 5 $\frac{^\circ}{min}$ . START -110 $^\circ$ C	SHIFT +5 IN.		

T $^\circ$ C (CORRECTED FOR SUBSTRATE) AT TIME THERMOANALYSIS



PART NO.900327



<b>SAMPLE:</b> ANB-3066 Lot 027G  <b>ORIGIN:</b>	SIZE 1.99 in REF. PROGRAM MODE Heat RATE 5 $\frac{^\circ\text{C}}{\text{min}}$ START -110 $^\circ\text{C}$	ATM. SCALE SETTING 20 $\frac{^\circ\text{C}}{\text{in}}$ SHIFT +5 IN.	RUN NO. DATE OPERATOR
	T $\Delta$ T 20 $\frac{^\circ\text{C}}{\text{in}}$ 6.6 $\frac{^\circ\text{C}}{\text{in}}$		

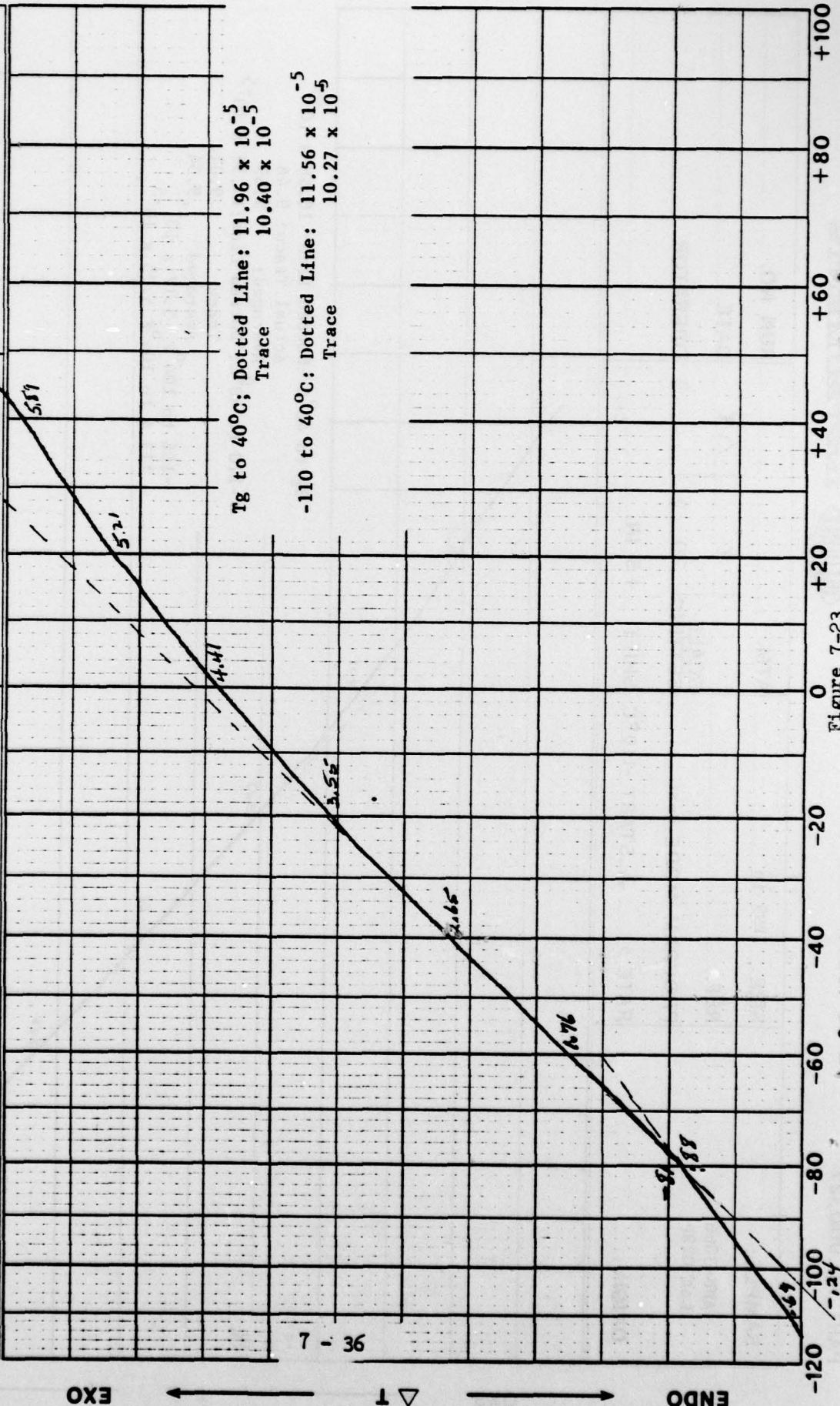
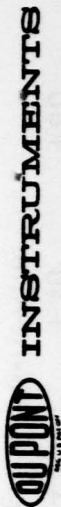


Figure 7-23



PART NO.900327



<b>SAMPLE:</b> ANB-3066 Lot 023P  <b>ORIGIN:</b>	SIZE .200 in	ATM.	RUN NO.
	REF.	T	DATE
	PROGRAM MODE Heat	SCALE SETTING 20 $\frac{^{\circ}\text{C}}{\text{IN}}$	OPERATOR
	RATE 5 $\frac{^{\circ}\text{C}}{\text{MIN}}$ , START $^{\circ}\text{C}$	SHIFT +5 IN.	

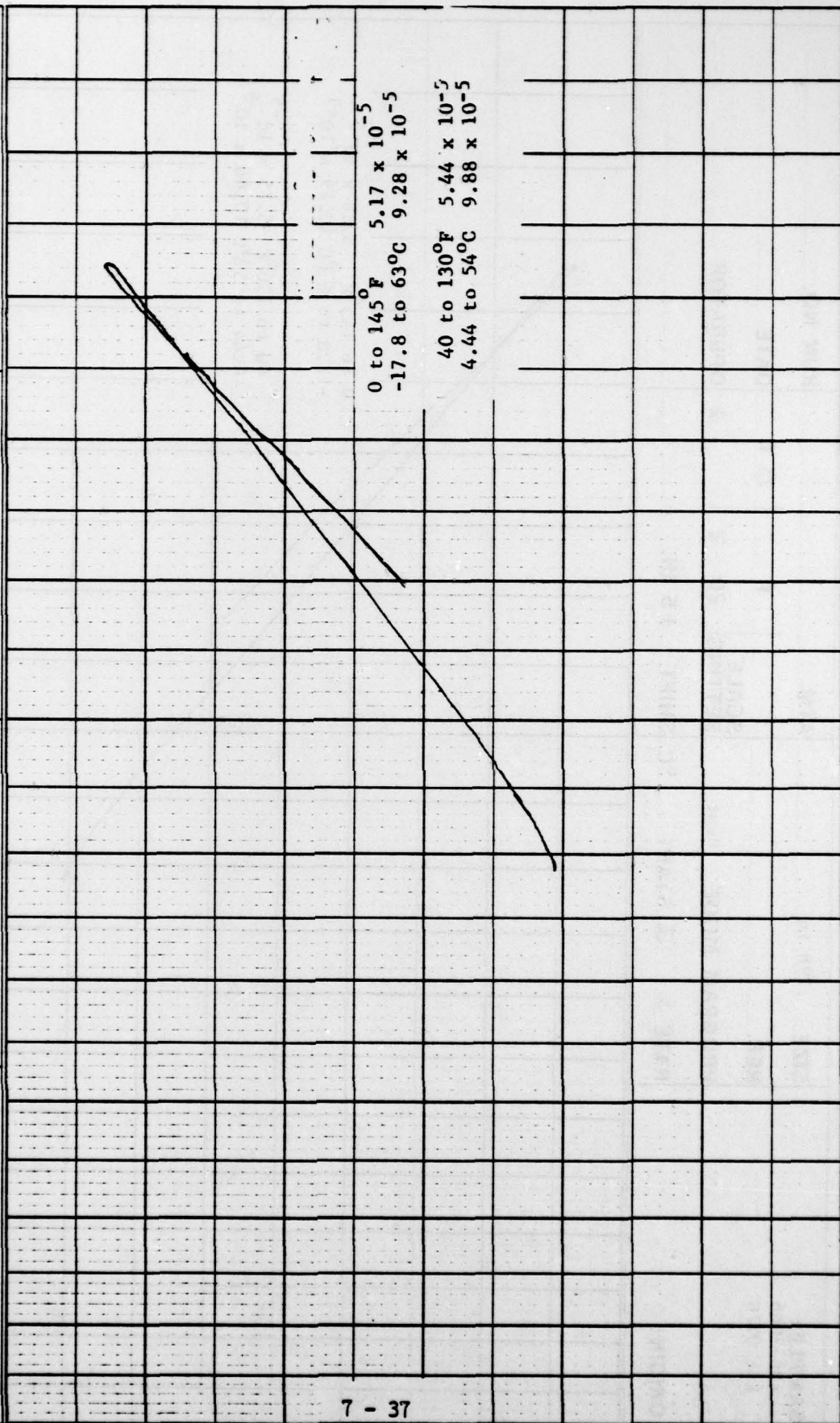
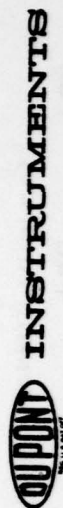


Figure 7-24  
THERMOGRAM FOR SUBSTANCE 1

PART NO.900327



<b>SAMPLE:</b> ANB-3066 Lot 027G  <b>ORIGIN:</b>	<b>SIZE</b> .198 in	<b>ATM.</b>	<b>RUN NO.</b>	
	<b>REF.</b>	<b>T</b>	<b>DATE</b>	
	<b>PROGRAM MODE</b> Heat	<b>SCALE SETTING</b> 20 $\frac{^{\circ}\text{C}}{\text{IN}}$	<b>OPERATOR</b>	
	<b>RATE</b> 5 $\frac{^{\circ}\text{C}}{\text{MIN}}$	<b>START</b> $^{\circ}\text{C}$	<b>SHIFT</b> +5 IN.	

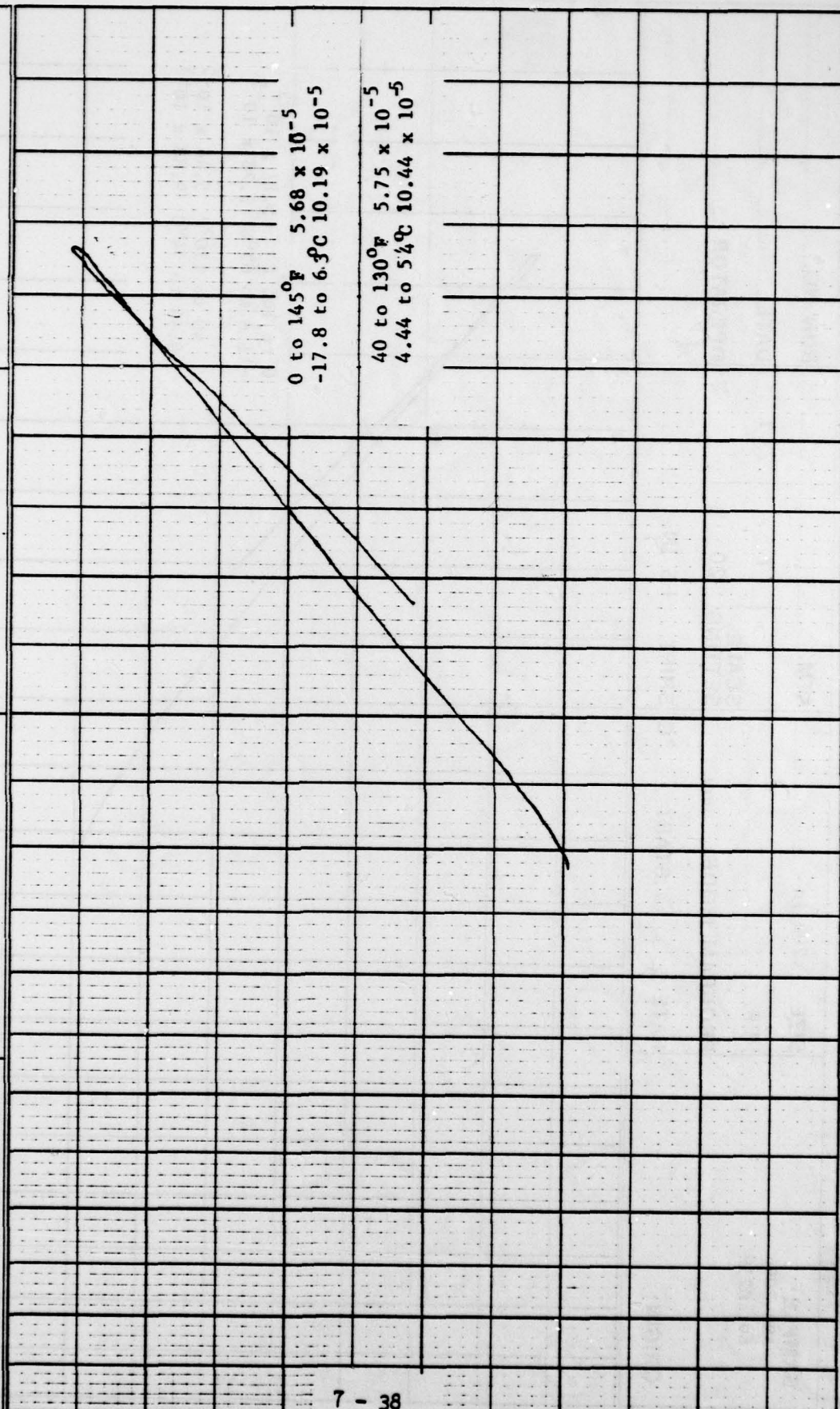


Figure 7-25  
 IT OR CONNECTION FOR CUMULATIVE THERMOGRAMS



## SECTION VIII

### CASE LINER BONDS

Cartons of propellant were lined with SD-851-2 liner/V45 rubber simulating motor conditions. In the preparation of the cartons, liner sometimes penetrated the propellant to a depth of 0.5 inches. Irregularities are most apparent on outer surfaces. Corners may be particularly affected by curvature of the insulation.

Liner color varies from a pale buff to a deep pink which apparently develops from the anti-oxidant used. In general, the pink liner tends to be sticky and strings out in tensile testing.

Aerojet did a study of 44 manufacturing variables to determine those which had a significant effect on liner bond strength. According to their report (MVS-1, June 76) several factors had a statistically significant effect on bond strength. Initial high bond strength and low insulation moisture content usually mean a longer time to degradation of the liner bond.

#### A. CONSTANT LOAD SHEAR AND TENSILE:

Constant load shear specimens are 2 inches (5.08 cm) in diameter and 0.2 inches (.508 cm) thick bonded to aluminum tabs. Specimens are mounted in shear mode on a constant load frame.

Constant load tensile specimens are 2 inches (5.08 cm) in diameter with a filet which reduces the propellant/liner/insulation interface to 1.5 inches (3.81 cm). The propellant below this interface is bonded into pipe sections. An aluminum end tab is bonded to the insulation. Specimens are tested in tensile mode on a constant load frame.



Loads are supplied by steel plates (nominally 10 pounds, but weighed accurately) suspended on steel rods. The load is applied when a hydraulic jack is released. Time-to-failure is measured by a stop watch at high loads or by electrically activated clocks with low loads. Times-to-failure between one minute and 100 minutes, are to be desired. However, because liners vary considerably in properties it is difficult to obtain such data directly. Therefore, three specimens are stressed at each of the four loads.

The statistical analysis of the data includes correlation plots of the parameters log stress vs log time-to-failure for both tests (figures 8-1 thru 8-4). These analyses can be used to predict the amount of stress needed to cause failure at a specified time. These data have been extracted for one minute and 100 minute time periods and summarized in Table 8-1. In this type of regression analysis aging effects are not visible as the data are not arranged chronologically.

In order to determine if aging is affecting the propellant-liner bond, a time-dependent regression analysis was made on selected parameters (figures 8-5 thru 8-8). In these analyses sample age is the independent variable and the parameter "time-to-break" is the dependent variable. In order to obtain enough data points for a meaningful study a range of stress values (20-30 psi or 40-50 psi) was used.

The results of these analyses indicate that age is not affecting the parameter "time-to-break" either in the tension or shear mode. However, the data has considerable scatter which may be masking any aging effects.

#### B. MINI-DPT:

This specimen is a 1.0" x 1.0" x 0.5" (2.54 x 2.54 x 1.27 cm) bonded to aluminum end tabs. The specimen is tested in the tensile mode on the Instron at 0.5 in/min (0.02 cm/sec).

Regressions for ANB "G" and "P" polymer are given in figures 8-9 and 8-10. There is a significant decrease in maximum stress for "G" and "P" polymer, with a significant increase in time to maximum stress for "P" polymer.

C. HIGH RATE BOND SHEAR:

This is a poker chip specimen 2 inches in diameter tested at 100 in/min (4.23 cm/sec) on the high rate tester with 600 psi nitrogen. No regressions were made since not all the data is in the computer. Time-to-failure, however, is much less than reported by ASPC.

D. OTHER TESTS:

Swell ratio and gel filler have been determined on a limited number of specimens, but no regressions have been made. There should be sufficient data at the next report period so that regressions can be made.

TABLE 8-1

Summary of Regression Analyses, Stress vs Time to Failure

Test	Type	Intercept		Slope		Std Error Syx	Correl Coeff.	Nr. of Spec.	Predicted Stress to Cause Failure	
		Mean a	Std Dev a	Mean b	Std Dev b				Mean at 1 min	Mean At 100 min
Constant	ANB	16.992	0.595	-9.445	0.358	0.930	-0.808	371	62.955	38.661
Load										
Tensile	ANT	13.517	0.741	-6.973	0.427	1.163	-0.635	396	86.781	44.835
Constant	ANB	12.749	0.323	-7.764	0.202	0.622	-0.884	413	43.861	24.237
Load										
Shear	ANT	13.738	0.342	-8.196	0.214	0.589	-0.887	401	47.439	24.048

$\infty$   
 1  
 4



$\text{LOG (Y)} = ((+1.2749432\text{E}+01) + (-7.7042249\text{E}+00) \times \text{LOG (X)})$   
 $r = +1.4762143\text{E}+03$  SIGNIFICANCE OF F = SIGNIFICANT  $G_r = +1.3310592\text{E}+00$   
 $R = -8.8443128\text{E}-01$  SIGNIFICANCE OF R = SIGNIFICANT  $S_r = +2.0208002\text{E}-01$   
 $t = +3.8421535\text{E}+01$  SIGNIFICANCE OF t = SIGNIFICANT  $S_t = +6.2192120\text{E} 01$   
 $N = 413$  DEGREES OF FREEDOM = 411

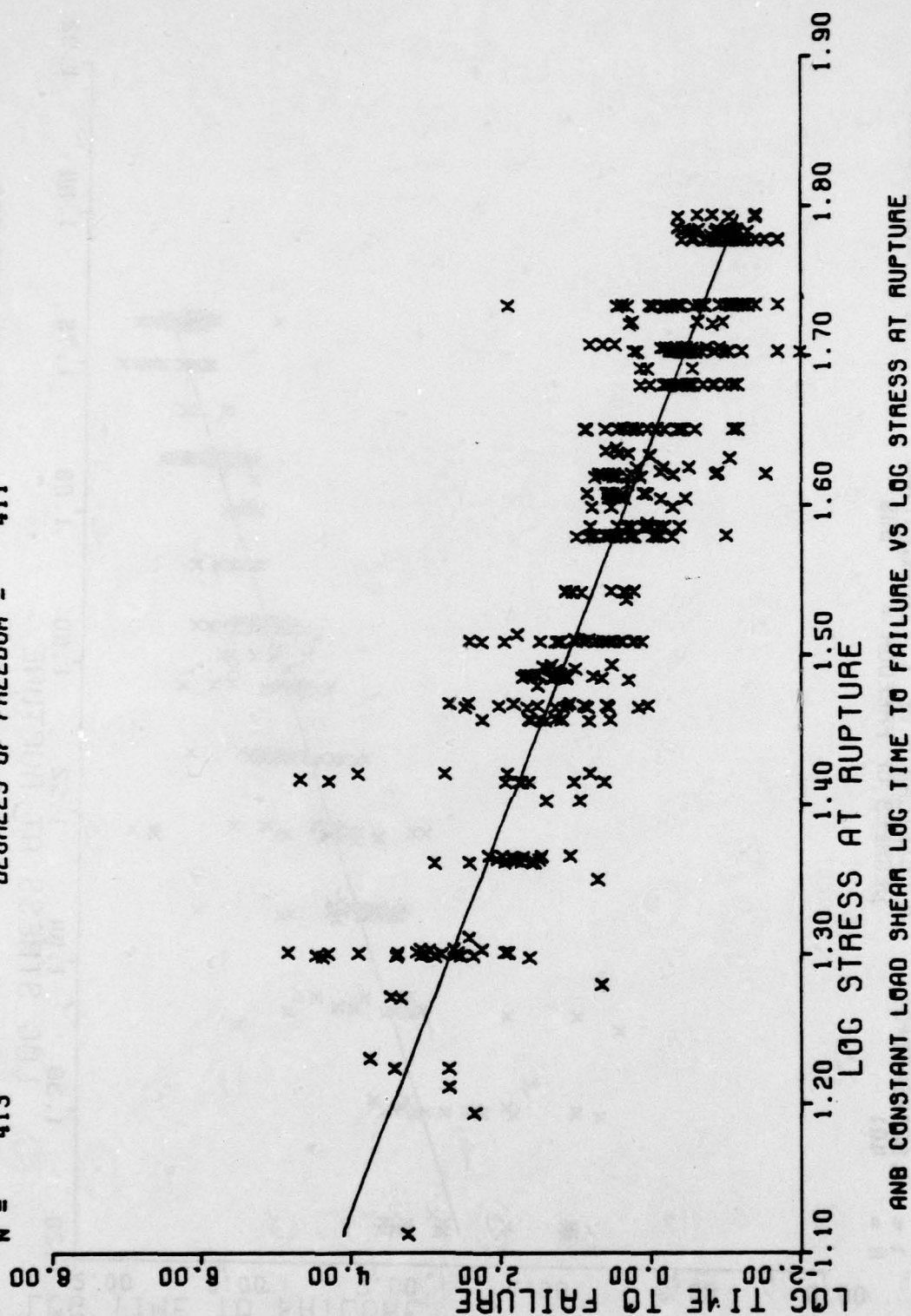
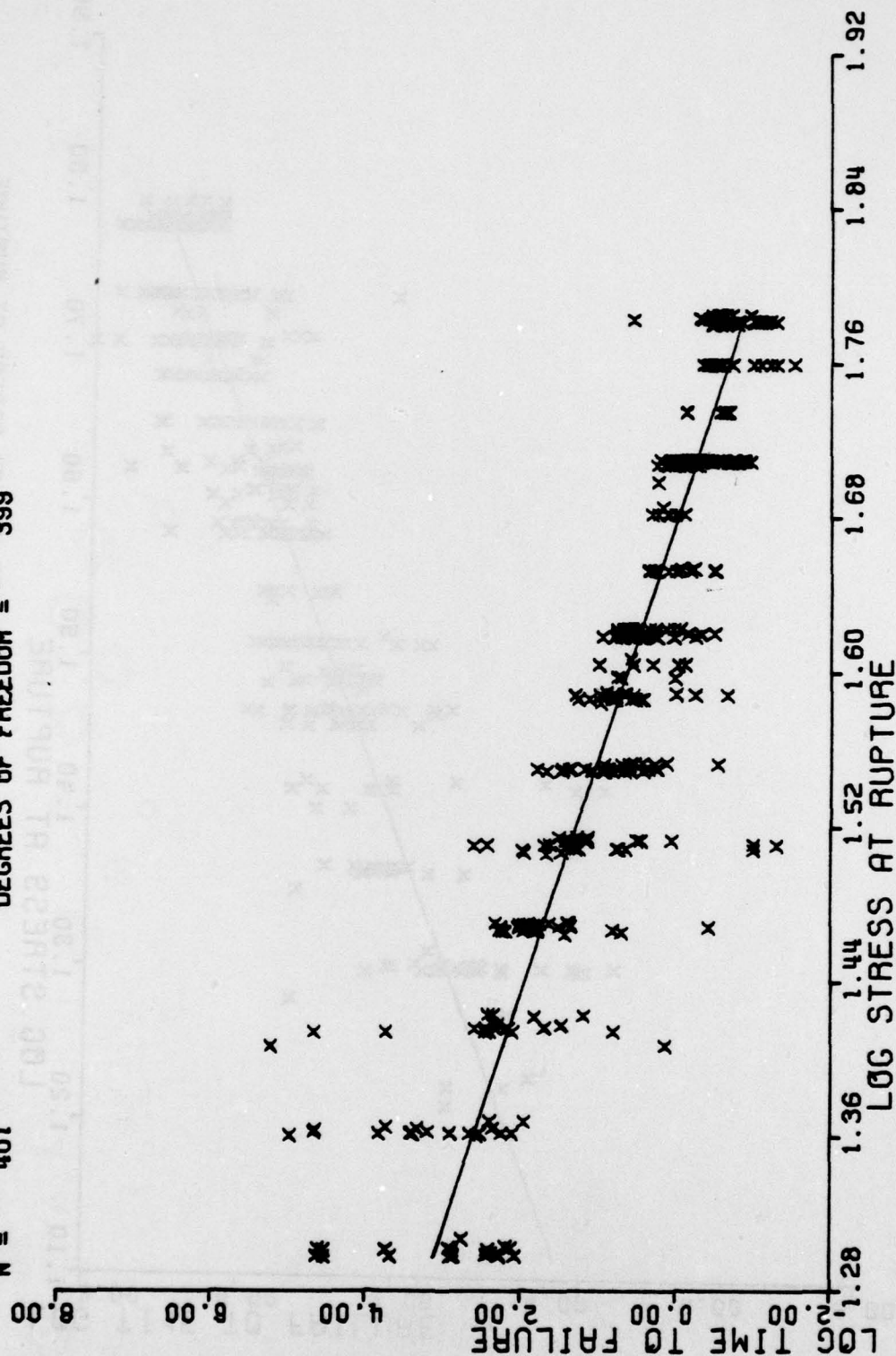


Figure 8-1

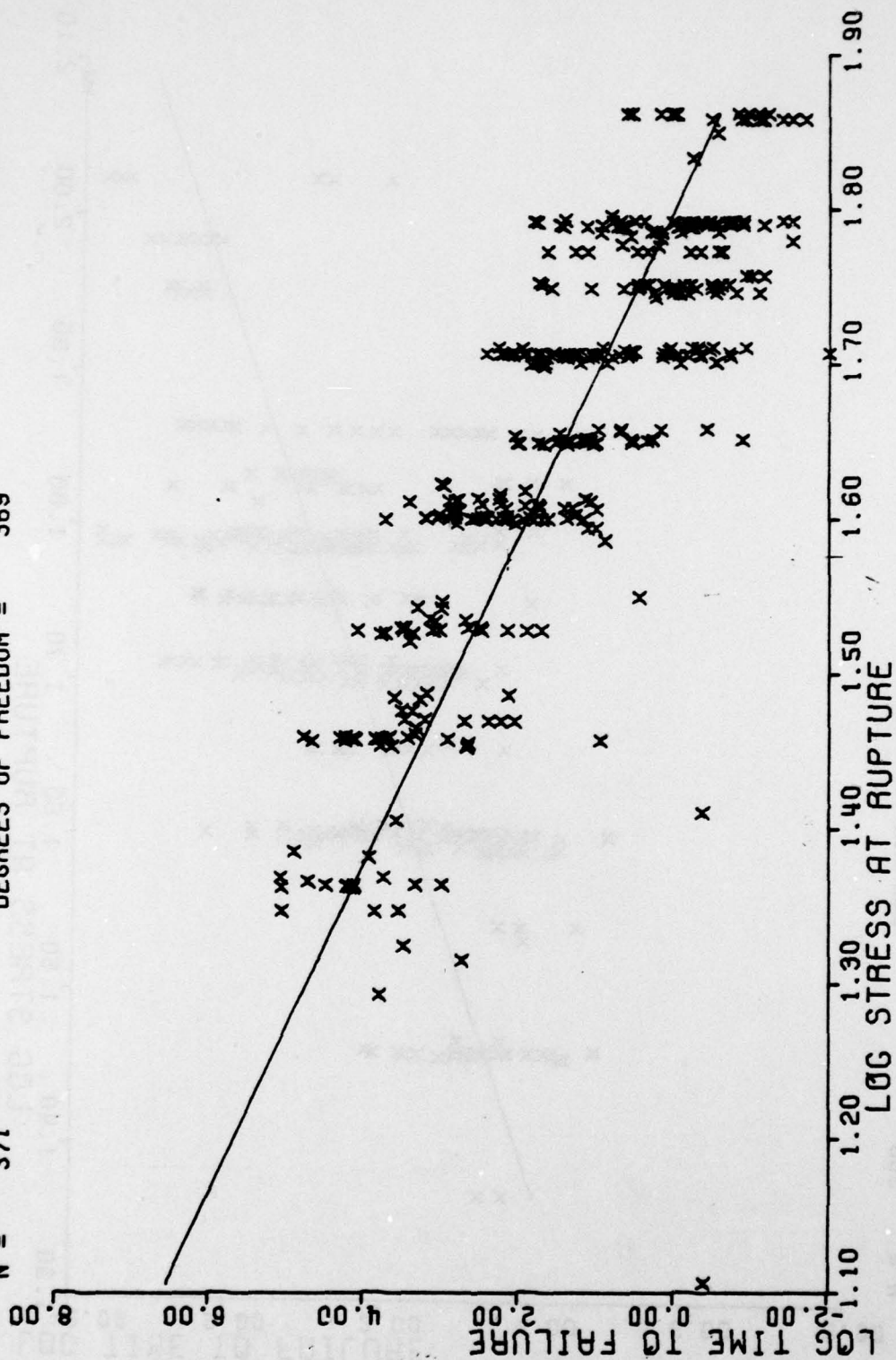
$\text{LOG } (t) = (1 + 1.3738414E+01) + (-8.1964826E+00) * \text{LOG } (X)$   
 $F = +1.4655762E+03$  SIGNIFICANCE OF F = SIGNIFICANT  
 $R = -8.8657225E-01$  SIGNIFICANCE OF R = SIGNIFICANT  
 $t = +3.8282845E+01$  SIGNIFICANCE OF t = SIGNIFICANT  
 $N = 401$  DEGREES OF FREEDOM = 399



ANT CONSTANT LOAD SHEAR LOG TIME TO FAILURE VS LOG STRESS AT RUPTURE

Figure 8-2

$\text{LOG}(Y) = ((+1.6991708E+01) + (-9.4449394E+00) * \text{LOG}(X))$   
 $F = +6.9531658E+02$  SIGNIFICANCE OF F = SIGNIFICANT  
 $R = -8.0826891E-01$  SIGNIFICANCE OF R = SIGNIFICANT  
 $t = +2.6368856E+01$  SIGNIFICANCE OF t = SIGNIFICANT  
 $N = 371$  DEGREES OF FREEDOM = 369

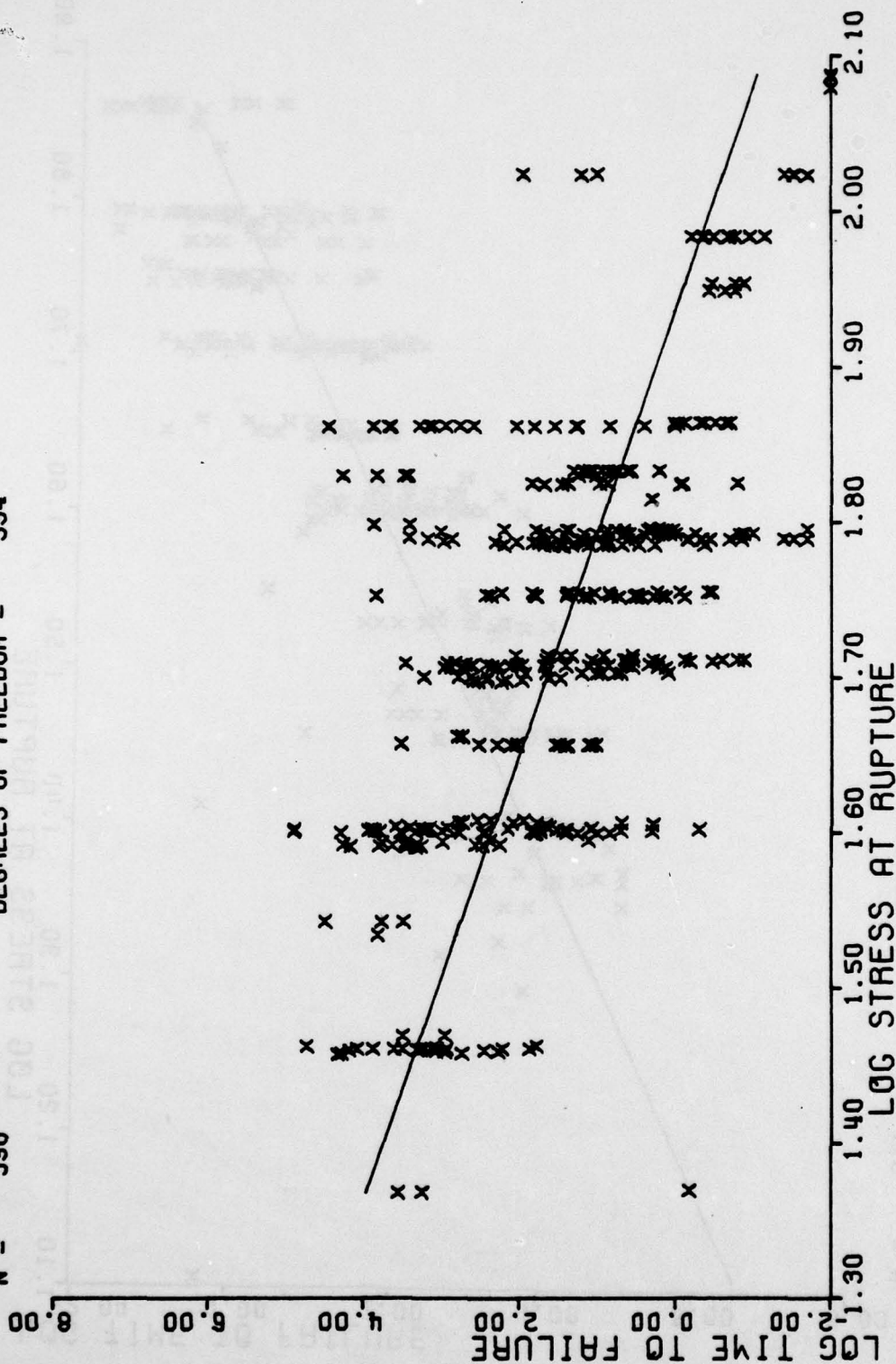


ANB CONSTANT LOAD TENSILE LOG TIME TO FAILURE VS LOG STRESS AT RUPTURE

Figure 8-3



$\text{LOG}(Y) = ((+1.3517420E+01) + (-6.9734055E+00) * \text{LOG}(X))$   
 $r = +2.6677043E+02$  SIGNIFICANCE OF F = SIGNIFICANT  $\sigma = +1.5042690E+00$   
 $R = -6.3539464E-01$  SIGNIFICANCE OF A = SIGNIFICANT  $S_e = +4.2694907E-01$   
 $t = +1.6333108E+01$  SIGNIFICANCE OF t = SIGNIFICANT  $S_t = +1.1630510E+00$   
 $N = 396$  DEGREES OF FREEDOM = 394



ANT CONSTANT LOAD TENSILE LOG TIME TO FAILURE VS LOG STRESS AT RUPTURE

Figure 8-4

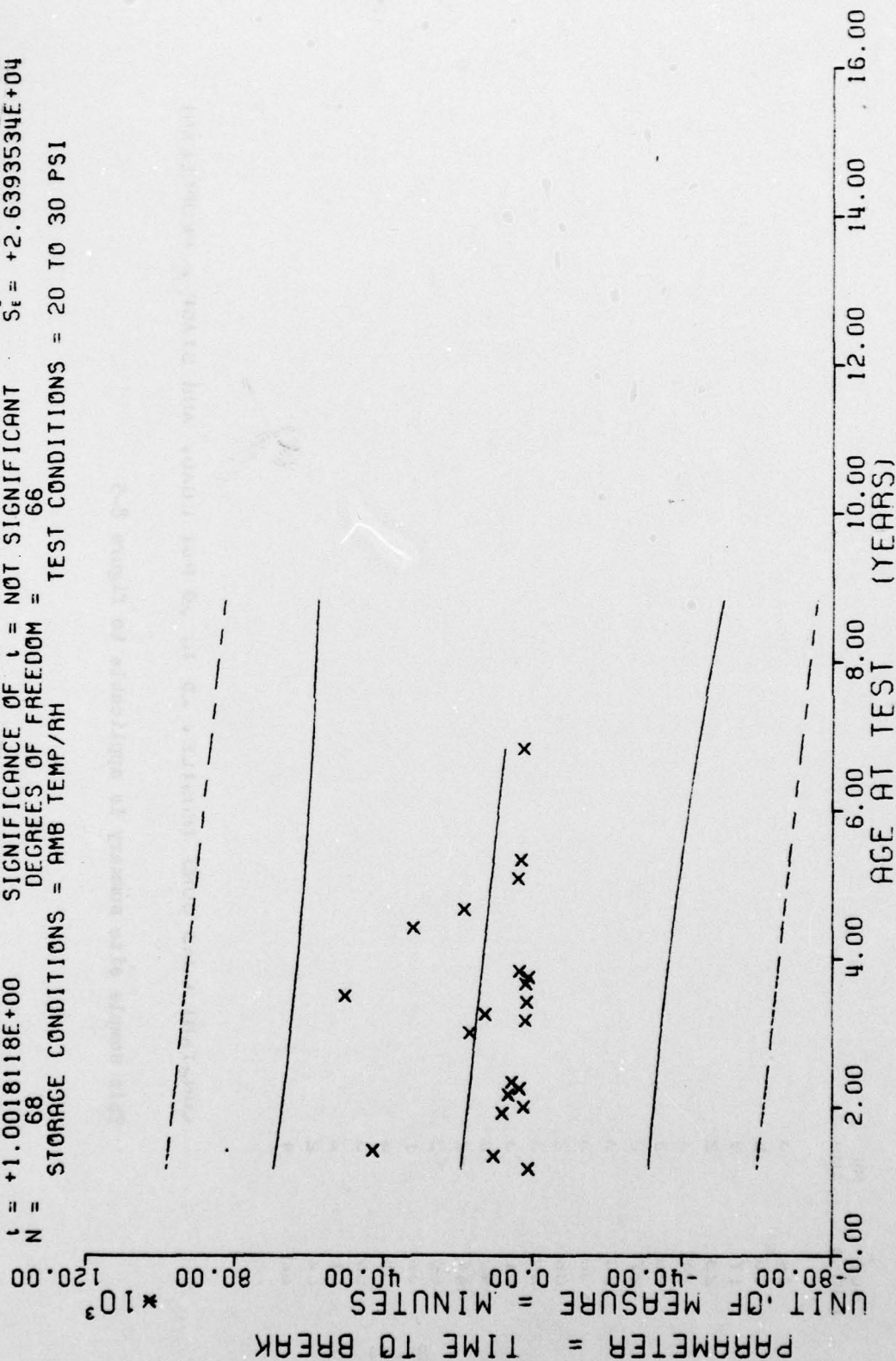
\*\*\* SAMPLE SIZE SUMMARY \*\*\*

AGE (MO)	NR SAMP
14	3
15	5
17	9
23	2
24	3
25	3
27	2
28	3
30	3
36	2
39	3
41	3
42	2
44	2
45	3
48	1
53	3
56	5
61	2
64	2
66	4

CONSTANT LOAD GUND MISSILE, 20 TO 30 PSI LOAD, AND STAGE 2 PROPELLANT

This sample size summary is applicable to figure 8-5

$Y = ((+2.1662756E+04) + (-1.7210806E+02) * X)$   
 SIGNIFICANCE OF F = NOT SIGNIFICANT  $G_1 = +2.6394248E+04$   
 SIGNIFICANCE OF R = NOT SIGNIFICANT  $S_0 = +1.7179678E+02$   
 SIGNIFICANCE OF t = NOT SIGNIFICANT  $S_e = +2.6393534E+04$   
 DEGREES OF FREEDOM = 66  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 20 TO 30 PSI



CONSTANT LOAD BOND TENSILE, 20 TO 30 PSI LOAD, AMB STAGE 2 PROPELLANT

Figure 8-5



\*\*\* SAMPLE SIZE SUMMARY \*\*\*

AGE (MUS)	NK SAMP
14	9
15	1
17	3
18	3
20	2
30	2
31	2
38	3
39	4
40	3
41	1
43	7
46	4
47	1
48	2
49	1
50	4
53	3
55	3
56	2
58	3
59	4

CONSTANT LOAD TENSILE, 40 TO 50 PSI LOAD, AND STAGE 2 POUPELLANI

This sample size summary is applicable to figure 8-6

$F = +1.9283748E+00$   
 $R = -1.6606152E-01$   
 $t = +1.3886593E+00$   
 $N = 70$   
 $Y = ((+3.6217386E+00) + (-3.6842368E-02) * X)$   
 SIGNIFICANCE OF F = NOT SIGNIFICANT  
 SIGNIFICANCE OF R = NOT SIGNIFICANT  
 SIGNIFICANCE OF t = NOT SIGNIFICANT  
 DEGREES OF FREEDOM = 68  
 STORAGE CONDITIONS = AMB TEMP/RH  
 TEST CONDITIONS = 40 TO 50 PSI

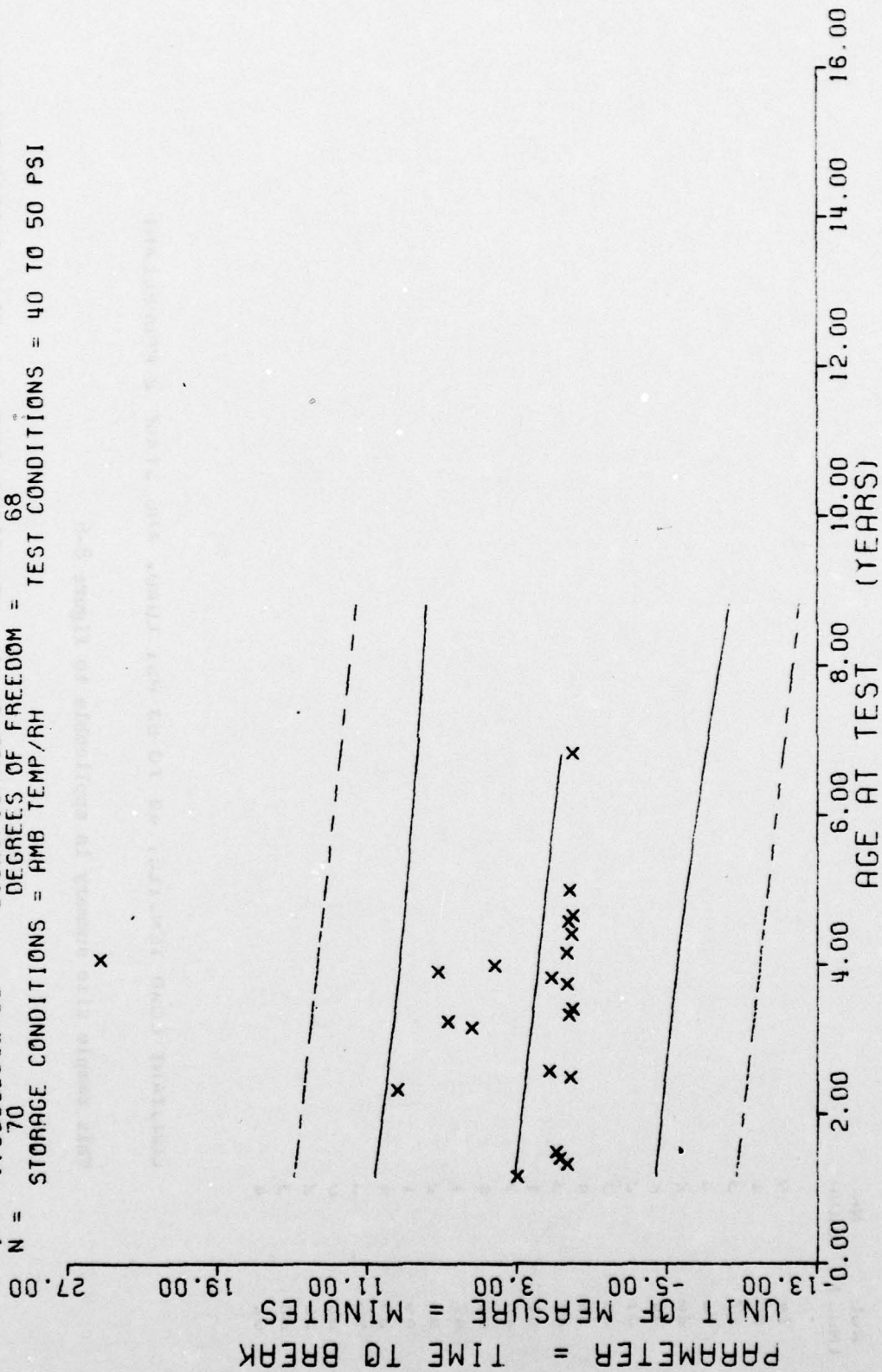


Figure 8-6

\*\*\* SAMPLE SIZE SUMMARY \*\*\*

AGE (MDS)	NR SAMP	AGE (MDS)	V2 SAMP
5	1	81	3
14	3	83	3
15	2		
19	2		
20	2		
21	3		
22	2		
23	3		
28	3		
36	1		
37	6		
40	2		
41	3		
42	7		
43	3		
45	8		
46	7		
47	1		
48	4		
52	2		
54	2		
56	3		
57	5		
61	3		
65	2		

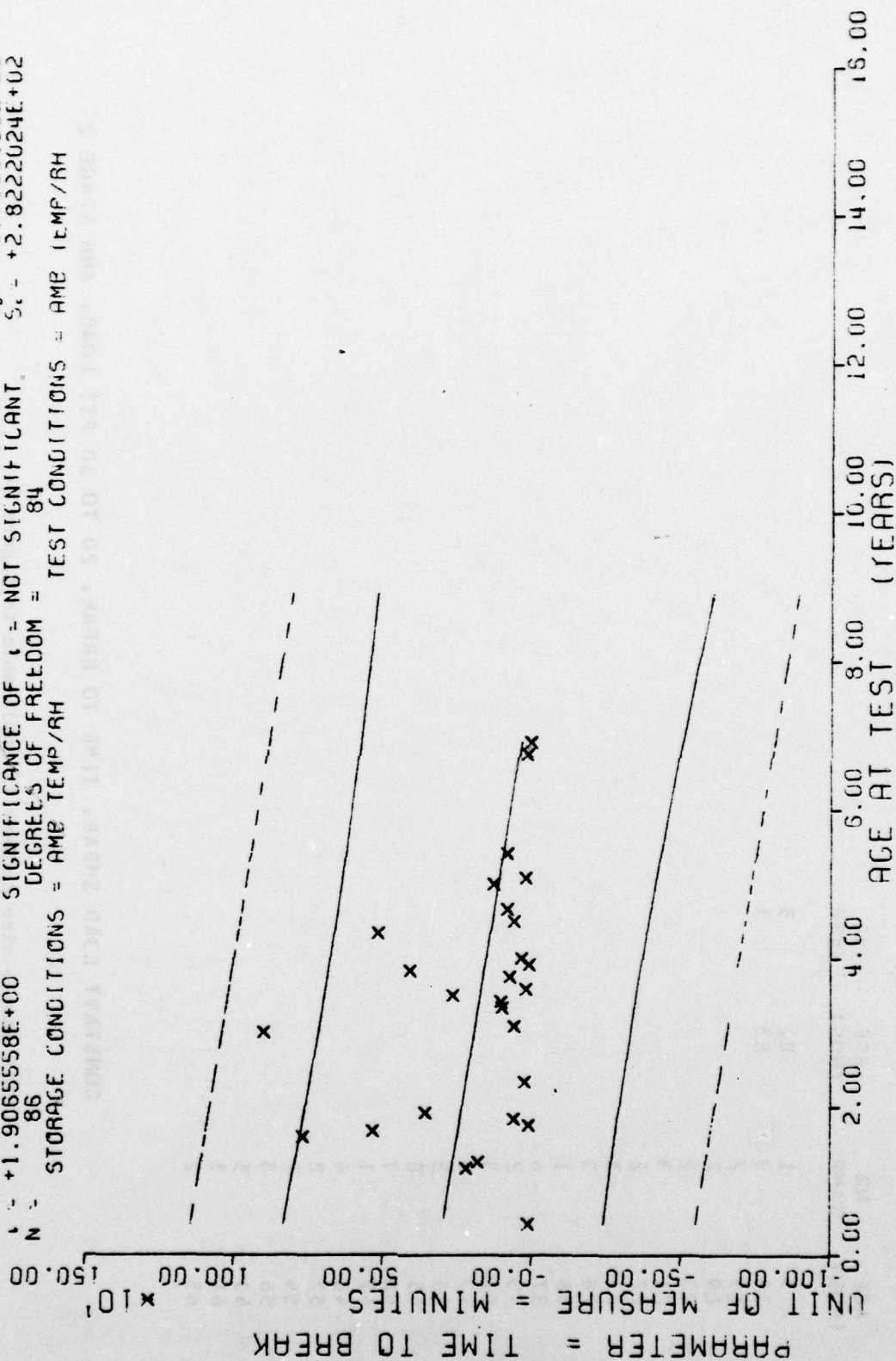
8 - 13

CONSTANT LOAD SHEAR, TIME TO BREAK, 20 TO 30 PSI LOAD, ANB STAGE 2

This sample size summary is applicable to figure 8-7



$F = +3.6349551E+00$   
 $R = -2.0366239E-01$   
 $S_e = +1.9065558E+00$   
 $N = 86$   
 $Y = (1 + 3.1333260E+02) + (1 - 3.3437554E+00) \times X$   
 SIGNIFICANCE OF F = NOT SIGNIFICANT  
 SIGNIFICANCE OF R = NOT SIGNIFICANT  
 SIGNIFICANCE OF  $S_e$  = NOT SIGNIFICANT  
 DEGREES OF FREEDOM = 84  
 STORAGE CONDITIONS = AMB TEMP/RH  
 TEST CONDITIONS = AMB TEMP/RH



CONSTANT LOAD SHEAR, TIME TO BREAK, 20 TO 30 PSI LOAD, ONE STAGE 2

Figure 8-7

\*\*\* SAMPLE SIZE SUMMARY \*\*\*

AGE (MOS)	NR SAMP	AGE (MOS)	VR SAMP
2	2	81	2
5	2	83	2
14	2		
17	2		
20	3		
22	4		
23	3		
25	3		
27	2		
28	2		
29	4		
32	4		
33	6		
35	2		
38	6		
41	2		
42	7		
43	3		
45	5		
45	5		
48	3		
56	2		
60	3		
61	3		
65	3		

CONSTANT LOAD SHEAR, TIME TO BREAK (1 MIN+), 40 TO 50 PSI LOAD, AND STAGE 2

This sample size summary is applicable to figure 8-8

Y = (1) +1.7440896E+00 ) + (-1.822/162E-02 ) \* X)  
 F +5.779933E-01 SIGNIFICANCE OF F - NOT SIGNIFICANT S<sub>e</sub> +3.837/238E+00  
 R +8.2183116E-02 SIGNIFICANCE OF R - NOT SIGNIFICANT S<sub>e</sub> +2.3974622E-02  
 t = +7.6026267E-01 SIGNIFICANCE OF t - NOT SIGNIFICANT S<sub>e</sub> +3.8471744E+00  
 N 87 DEGREES OF FREEDOM

STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH

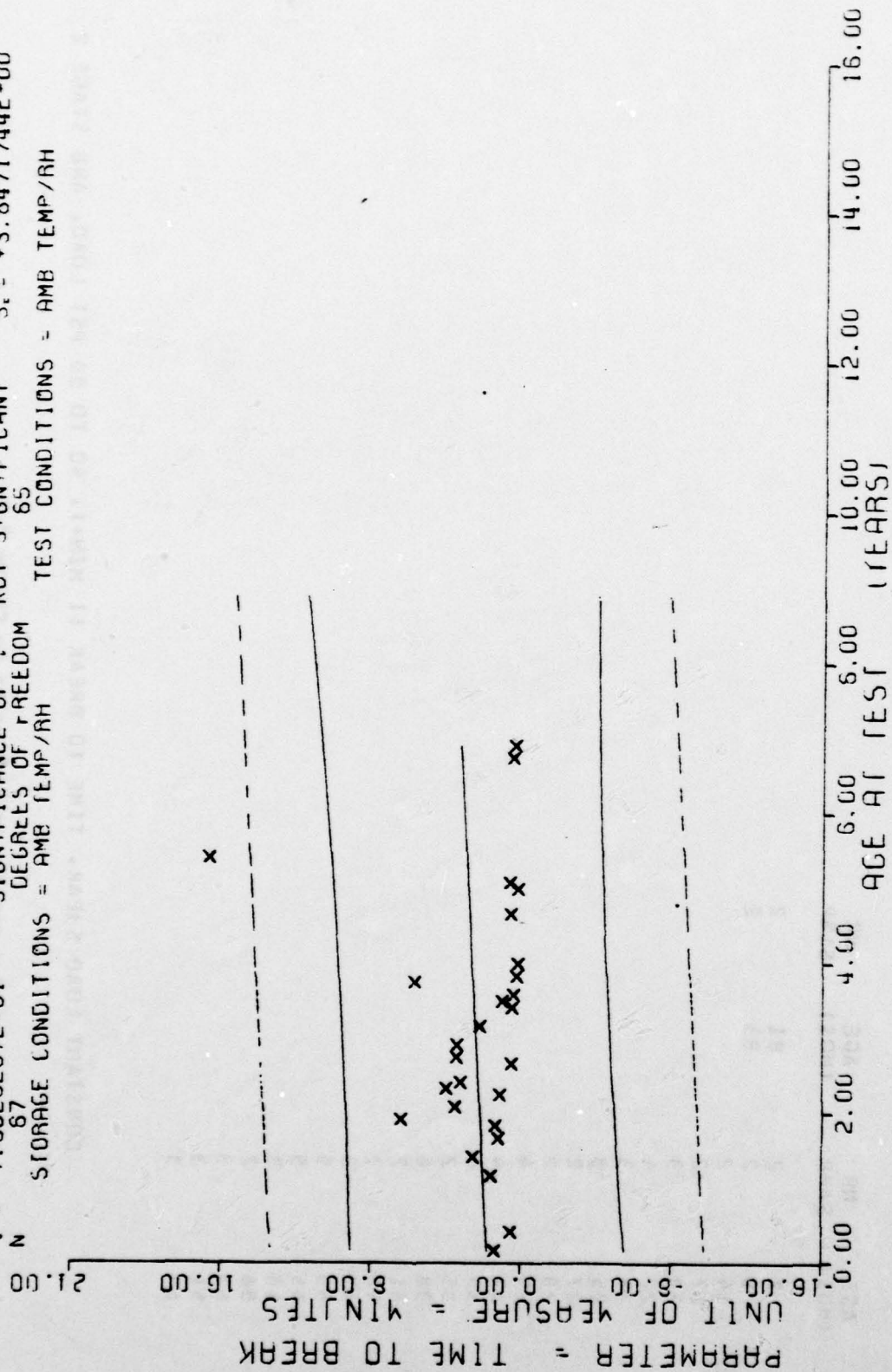


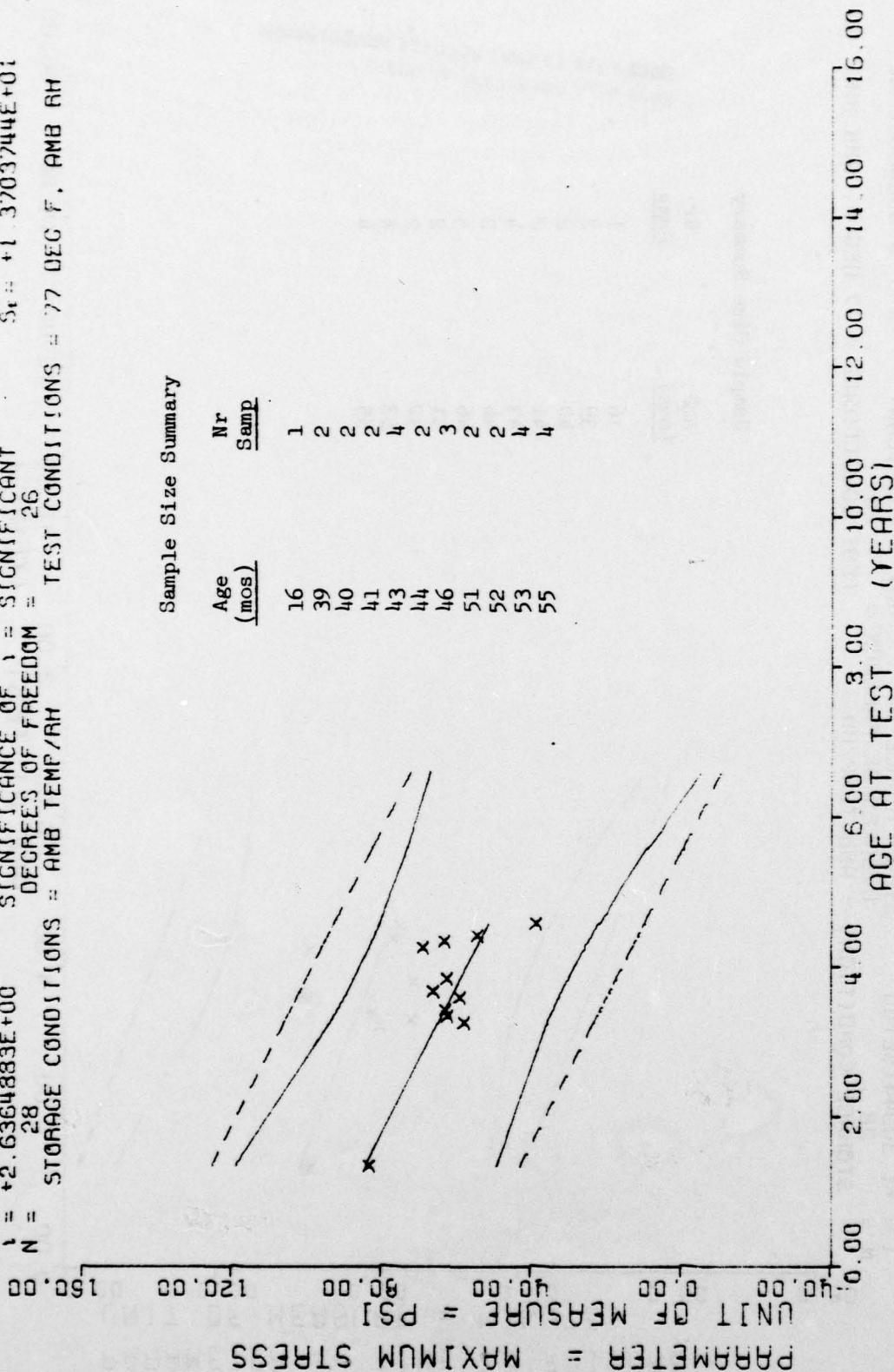
Figure 8-8



$Y = ((+9.7309450E+01) + (-8.5030542E-01) * X)$   
 $F = +6.9510710E+00$  SIGNIFICANCE OF F = SIGNIFICANT  $G_T = +1.5136823E+01$   
 $R = -4.5929434E-01$  SIGNIFICANCE OF R = SIGNIFICANT  $S_a = +3.2251438E-01$   
 $1 = +2.6364883E+00$  SIGNIFICANCE OF 1 = SIGNIFICANT  $S_t = +1.3703744E+01$   
 $N = 28$  DEGREES OF FREEDOM = 26  
 STORAGE CONDITIONS = AMB TEMP/AH TEST CONDITIONS = 77 DEG F, AMB RH

# Sample Size Summary

Age (mos)	Nr Samp
16	1
39	2
40	2
41	2
43	4
44	2
46	3
51	2
52	2
53	4
55	4



AMB 3066 PROPELLANT 'G' POLYMER, MINI OPT MAXIMUM STRESS, .5 IN/MIN, 77 DEG F

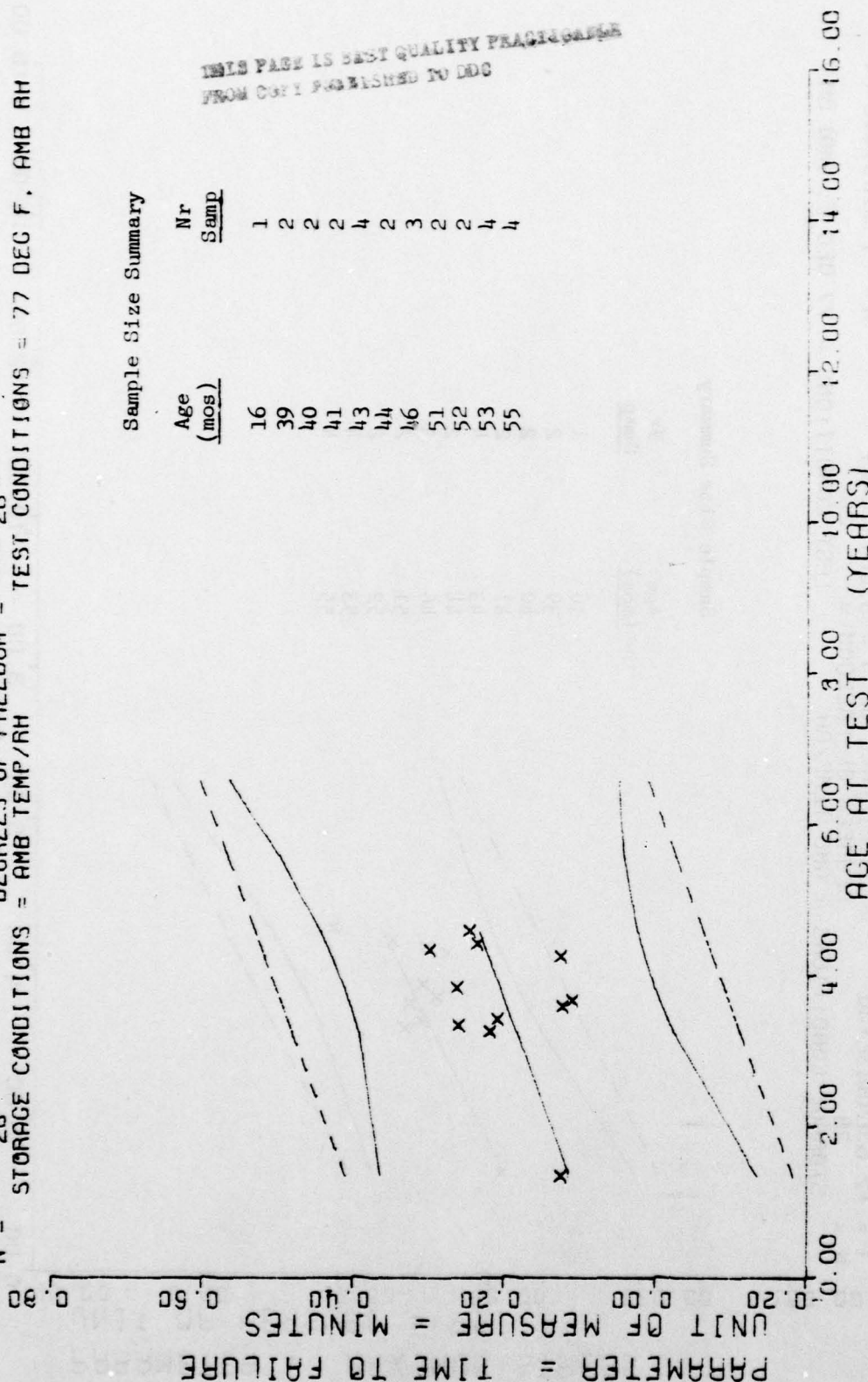
Figure 8-9

$Y = ((+6.5290275E-02) + (+3.0486627E-03) * X)$   
 $F = +1.7146370E+00$  SIGNIFICANCE OF F = NOT SIGNIFICANT  $G_r = +1.0022732E-01$   
 $R = +2.4873191E-01$  SIGNIFICANCE OF R = NOT SIGNIFICANT  $S_a = +2.3282160E-03$   
 $I = +1.3094415E+00$  SIGNIFICANCE OF I = NOT SIGNIFICANT  $S_t = +9.8926680E-02$   
 $N = 28$  DEGREES OF FREEDOM = 26  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 77 DEG F, AMB RH

THIS PAGE IS BEST QUALITY REPRODUCIBLE  
 FROM COPY FURNISHED TO DDC

Sample Size Summary

Age (mos)	Nr Samp
16	1
39	2
40	2
41	2
43	4
44	2
46	3
51	2
52	2
53	4
55	4



AMB 3066 PROPELLANT 'G' POLYMER, MINI OPT TIME TO FAILURE, .5 IN/MIN, 77 DEG F

Figure 8-10

\*\*\* SAMPLE SIZE SUMMARY \*\*\*

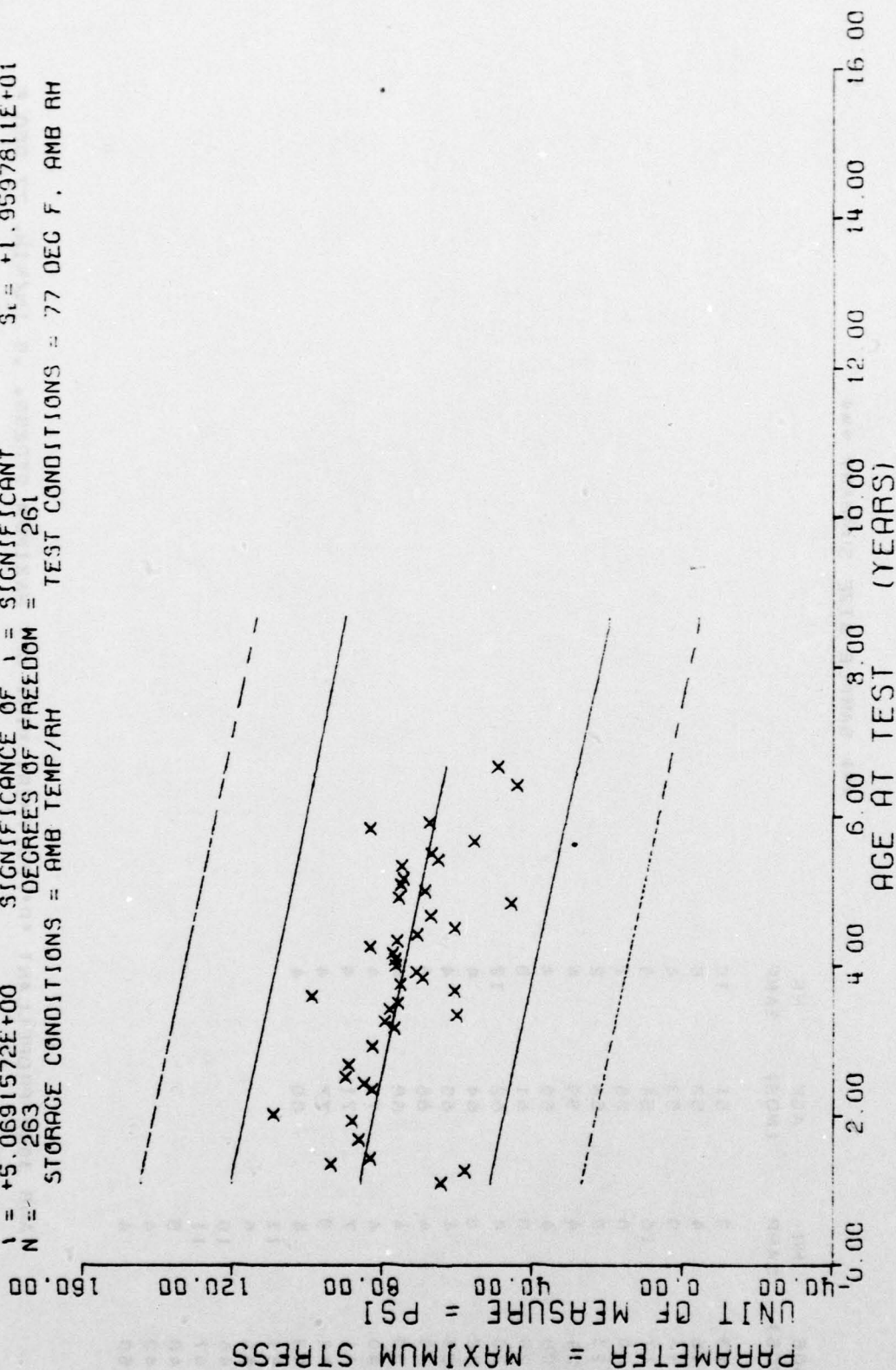
AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP
13	9	51	10
15	4	52	8
16	9	53	4
17	16	54	4
20	8	56	2
23	8	58	2
24	4	59	4
28	4	60	4
29	8	61	8
30	4	62	12
32	8	64	4
35	4	65	4
39	4	66	8
39	4	68	4
40	4	70	4
41	7	71	4
42	9	77	4
43	4	80	4
44	11		
45	6		
46	10		
47	11		
48	5		
49	4		
50	4		

ANR 3066 PROPELLANT 'P' POLYMER. MINI DPT MAXIMUM STRESS. .5 IN/MIN. 77 DEG F

This sample size summary is applicable to figures 8-11 and 8-12



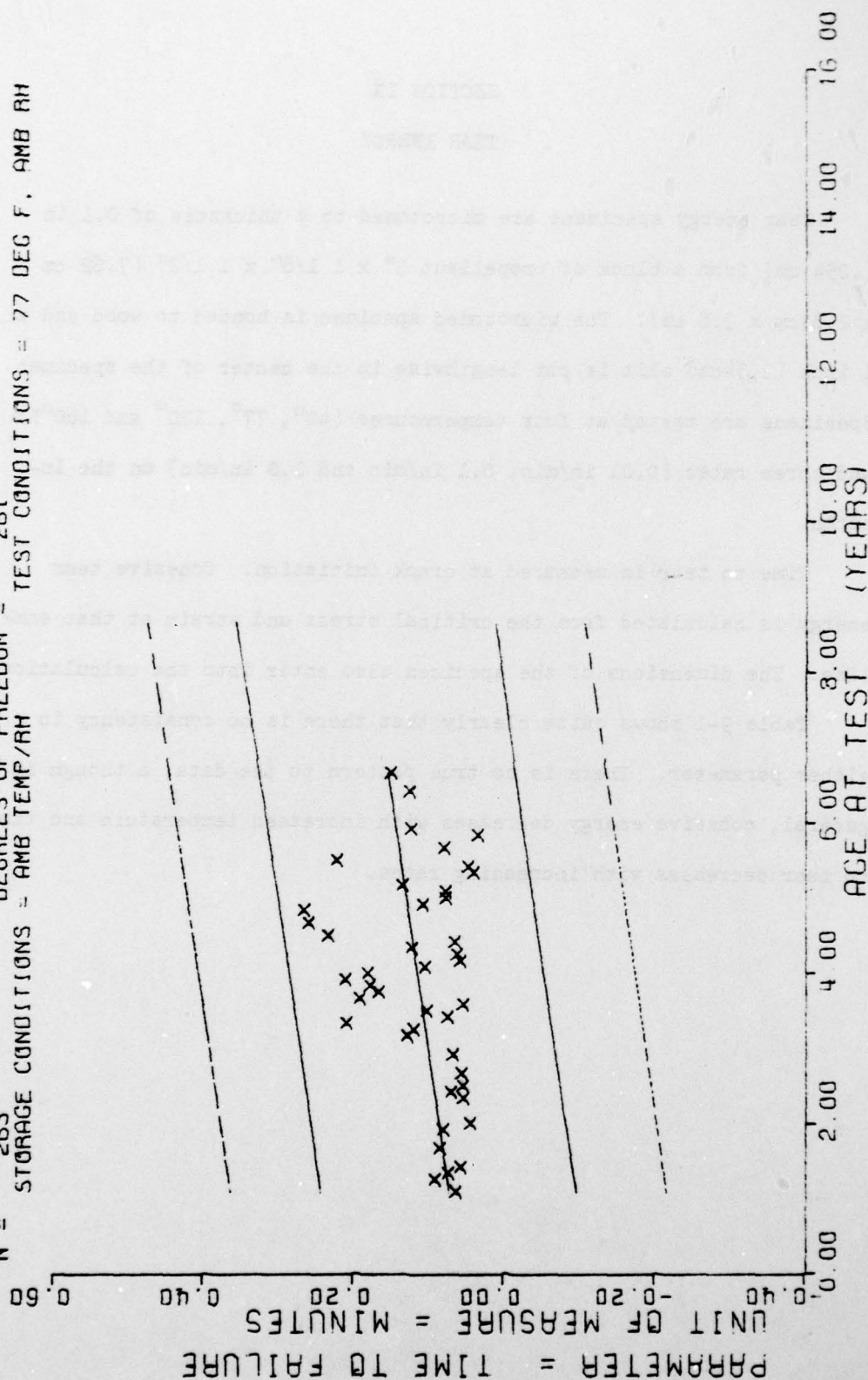
$F = +2.5696355E+01$  SIGNIFICANCE OF F =  $(-3.4799480E-01) \times X$   $G_R = +2.0500668E+01$   
 $R = -2.9938130E-01$  SIGNIFICANCE OF R = SIGNIFICANT  $S_d = +6.8649440E-02$   
 $A = +5.0691572E+00$  SIGNIFICANCE OF A = SIGNIFICANT  $S_t = +1.9597811E+01$   
 $N = 263$  DEGREES OF FREEDOM = 261  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 77 DEG F, AMB RH



ANB 3066 PROPELLANT 'P' POLYMER, MINI OPT MAXIMUM STRESS, .5 IN/MIN, 77 DEG F

Figure 8-11

$Y = ((+5.8278917E-02) + (+1.1904465E-03) * X)$   
 $F = +1.2301604E+01$  SIGNIFICANCE OF F = SIGNIFICANT  $S_T = +9.8962365E-02$   
 $R = +2.1215818E-01$  SIGNIFICANCE OF R = SIGNIFICANT  $S_d = +3.3941344E-04$   
 $I = +3.5073642E+00$  SIGNIFICANCE OF I = SIGNIFICANT  $S_r = +9.6894610E-02$   
 $N = 263$  DEGREES OF FREEDOM = 261  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 77 DEG F, AMB RH



AMB 3066 PROPELLANT 'P' POLYMER, MINS OPT TIME TO FAILURE, 5 IN/MIN, 77 DEG F

Figure 8-12

## SECTION IX

### TEAR ENERGY

Tear energy specimens are microtomed to a thickness of 0.1 in (.254 cm) from a block of propellant 3" x 1 1/8" x 1 1/2" (7.62 cm x 2.8 cm x 3.8 cm). The microtomed specimen is bonded to wood and a 1 inch (2.54cm) slit is cut lengthwise in the center of the specimen. Specimens are tested at four temperatures (40°, 77°, 120° and 160°F) and three rates (0.01 in/min, 0.1 in/min and 1.0 in/min) on the Instron.

Time to tear is measured at crack initiation. Cohesive tear energy is calculated from the critical stress and strain at that same time. The dimensions of the specimen also enter into the calculation.

Table 9-1 shows quite clearly that there is no consistency in either parameter. There is no true pattern to the data, although in general, cohesive energy decreases with increased temperature and time to tear decreases with increasing rates.



TABLE 9-1

## Significance of Regression Slopes

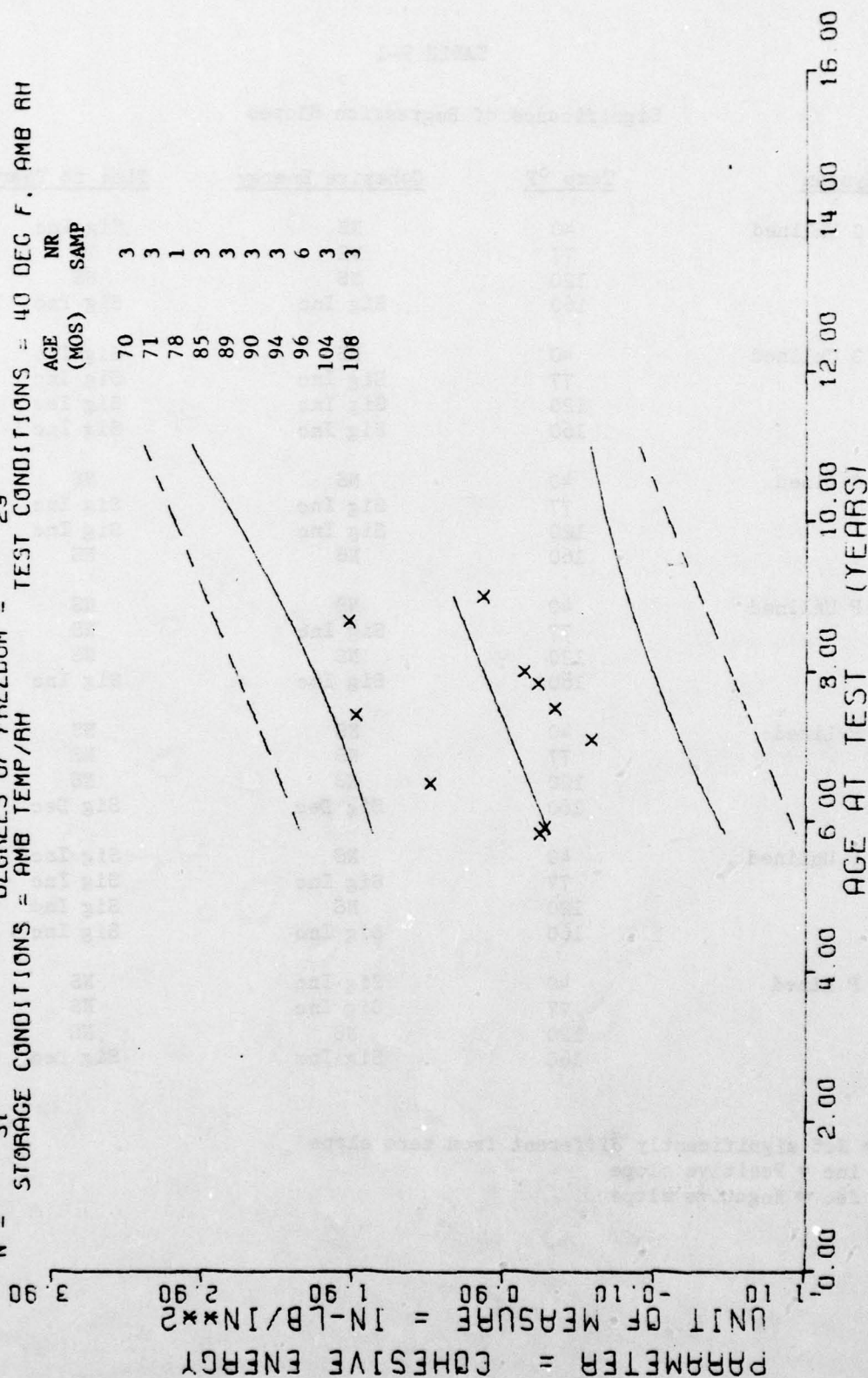
<u>System</u>	<u>Temp °F</u>	<u>Cohesive Energy</u>	<u>Time to Tear</u>
ANA G Unlined	40	NS	Sig Inc
	77	NS	NS
	120	NS	NS
	160	Sig Inc	Sig Inc
ANB G Unlined	40	NS	Sig Inc
	77	Sig Inc	Sig Inc
	120	Sig Inc	Sig Inc
	160	Sig Inc	Sig Inc
ANB G Lined	40	NS	NS
	77	Sig Inc	Sig Inc
	120	Sig Inc	Sig Inc
	160	NS	NS
ANB P Unlined	40	NS	NS
	77	Sig Inc	NS
	120	NS	NS
	160	Sig Inc	Sig Inc
ANB P Lined	40	NS	NS
	77	NS	NS
	120	NS	NS
	160	Sig Dec	Sig Dec
ANT P Unlined	40	NS	Sig Inc
	77	Sig Inc	Sig Inc
	120	NS	Sig Inc
	160	Sig Inc	Sig Inc
ANT P Lined	40	Sig Inc	NS
	77	Sig Inc	NS
	120	NS	NS
	160	Sig Inc	Sig Dec

NS = Not significantly different from zero slope

Sig inc = Positive slope

Sig dec = Negative slope

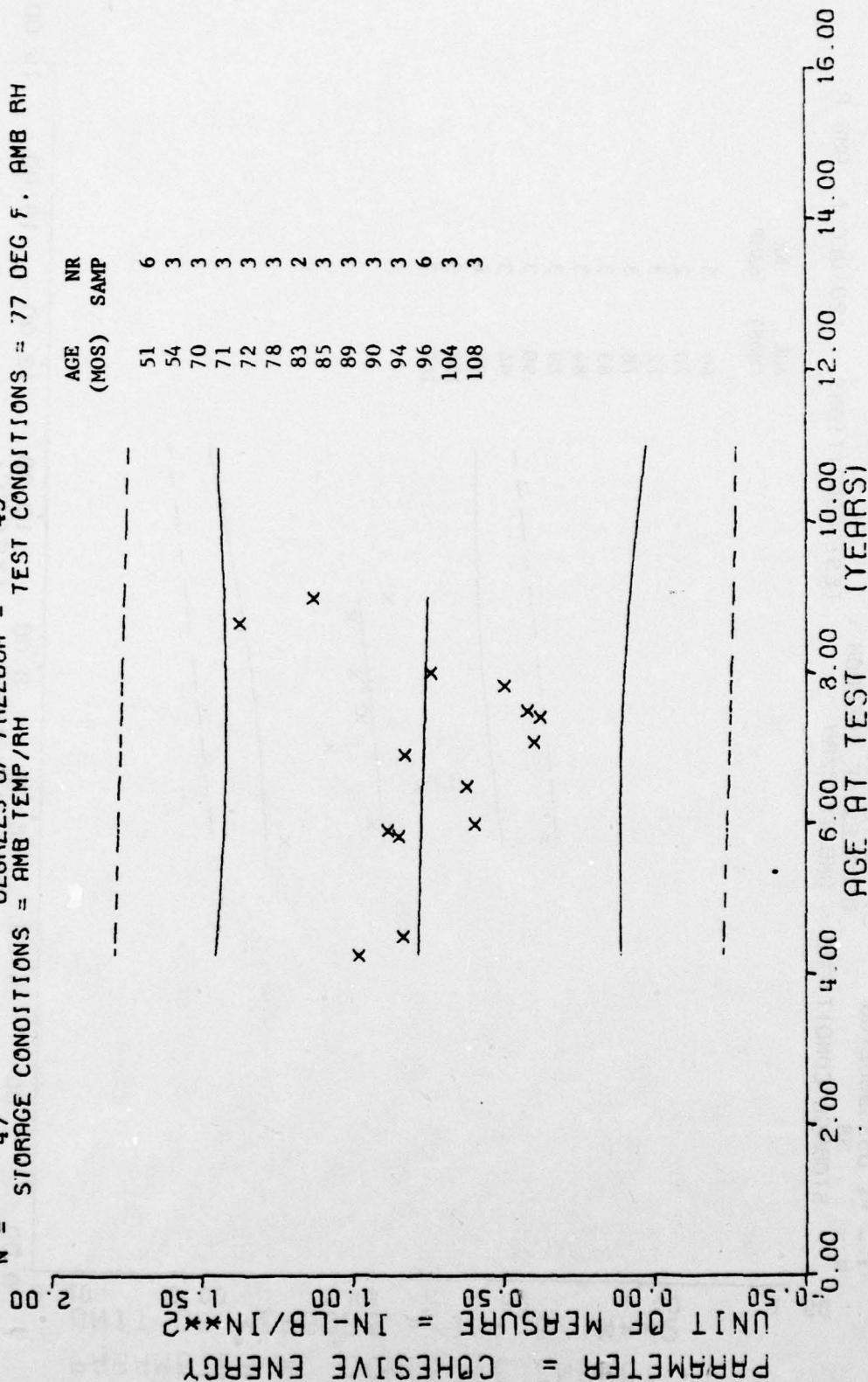
$\gamma = ((-5.803386E-01) + (+1.6842913E-02) \times X)$   
 SIGNIFICANCE OF F = NOT SIGNIFICANT  
 $S_r = +5.7534168E-01$   
 $S_a = +8.3261689E-03$   
 $S_e = +5.4780305E-01$   
 SIGNIFICANCE OF R = NOT SIGNIFICANT  
 SIGNIFICANCE OF 1 = NOT SIGNIFICANT  
 DEGREES OF FREEDOM = 29  
 STORAGE CONDITIONS = 40 DEG F. AMB RH



AMB 3066 PROPELLANT (ANA 'C') TEAR ENERGY, COHESIVE ENERGY 40 DEG F UNLND CTNS

Figure 9-1

$Y = ((+8.1374922E-01) + (-6.1511036E-04) * X)$   
 $F = +4.9086951E-02$  SIGNIFICANCE OF F = NOT SIGNIFICANT  $G = +3.3240874E-01$   
 $R = -3.3009582E-02$  SIGNIFICANCE OF R = NOT SIGNIFICANT  $S = +2.7763231E-03$   
 $I = +2.2155575E-01$  SIGNIFICANCE OF I = NOT SIGNIFICANT  $S_e = +3.3589872E-01$   
 $N = 47$  DEGREES OF FREEDOM = 45  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 77 DEG F, AMB RH



ANB 3066 PROPELLANT (ANA 'C') TEAR ENERGY, COHESIVE ENERGY 77 DEG F UNLND CTNS

Figure 9-2



$$Y = ((+6.6006763E-01) + (-2.1532629E-03) * X)$$

F	=	+1.1099859E+00	SIGNIFICANCE OF F	=	NOT SIGNIFICANT
R	=	-1.7294712E-01	SIGNIFICANCE OF R	=	NOT SIGNIFICANT
1	=	+1.0535586E+00	SIGNIFICANCE OF 1	=	NOT SIGNIFICANT
N	=	38	DEGREES OF FREEDOM	=	36
STORAGE CONDITIONS :: AMB TEMP/RH			TEST CONDITIONS :: 120 DEG F, AMB R		

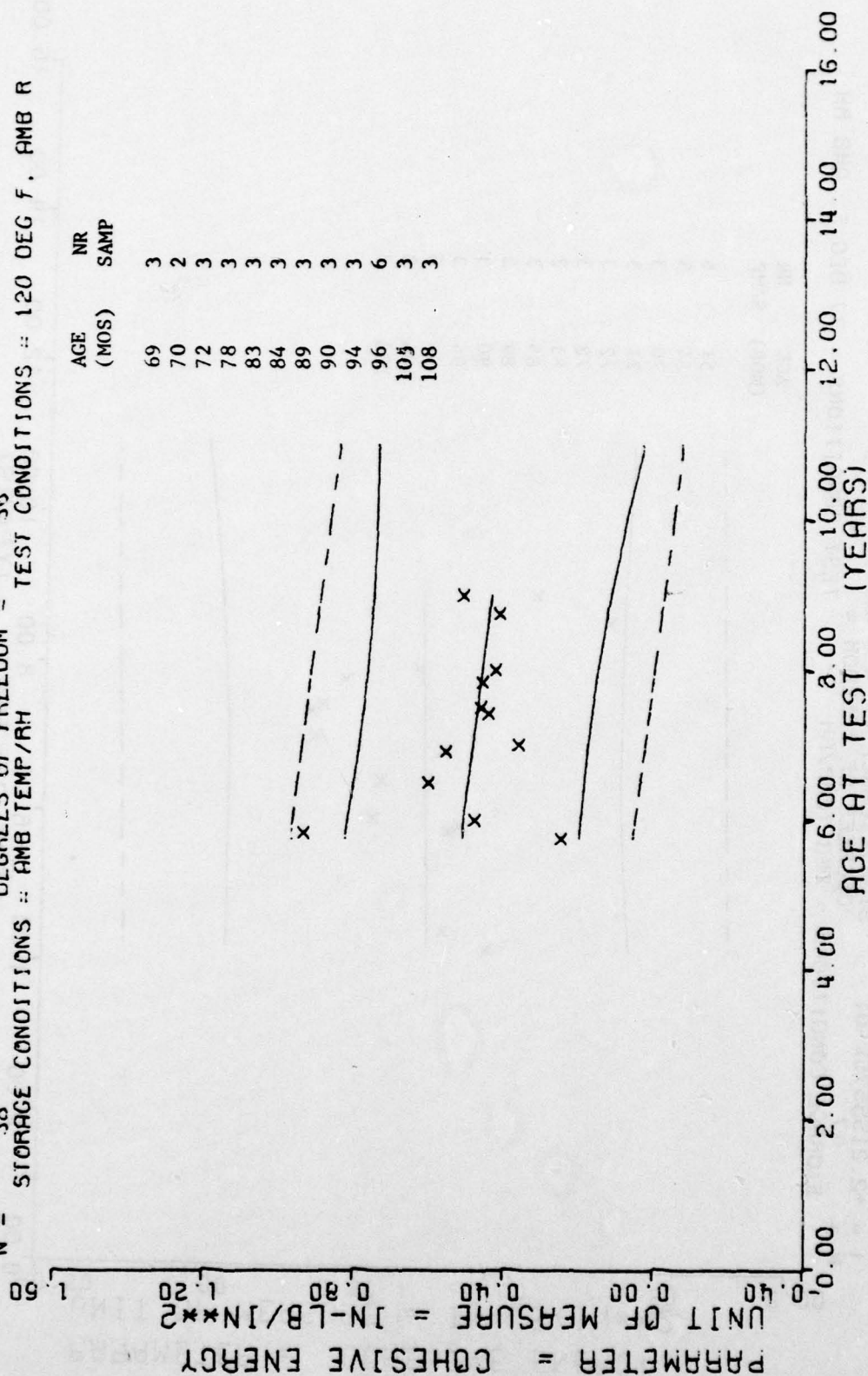


Figure 9-3

$Y = ((-1.4703519E-01) + (+5.7295908E-03) * X)$   
 $F = +2.7860722E+01$  SIGNIFICANCE OF F = SIGNIFICANT  
 $R = +6.7110224E-01$  SIGNIFICANCE OF R = SIGNIFICANT  
 $I = +5.2783257E+00$  SIGNIFICANCE OF I = SIGNIFICANT  
 $N = 36$  DEGREES OF FREEDOM = 34  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 160 DEG F, AMB R

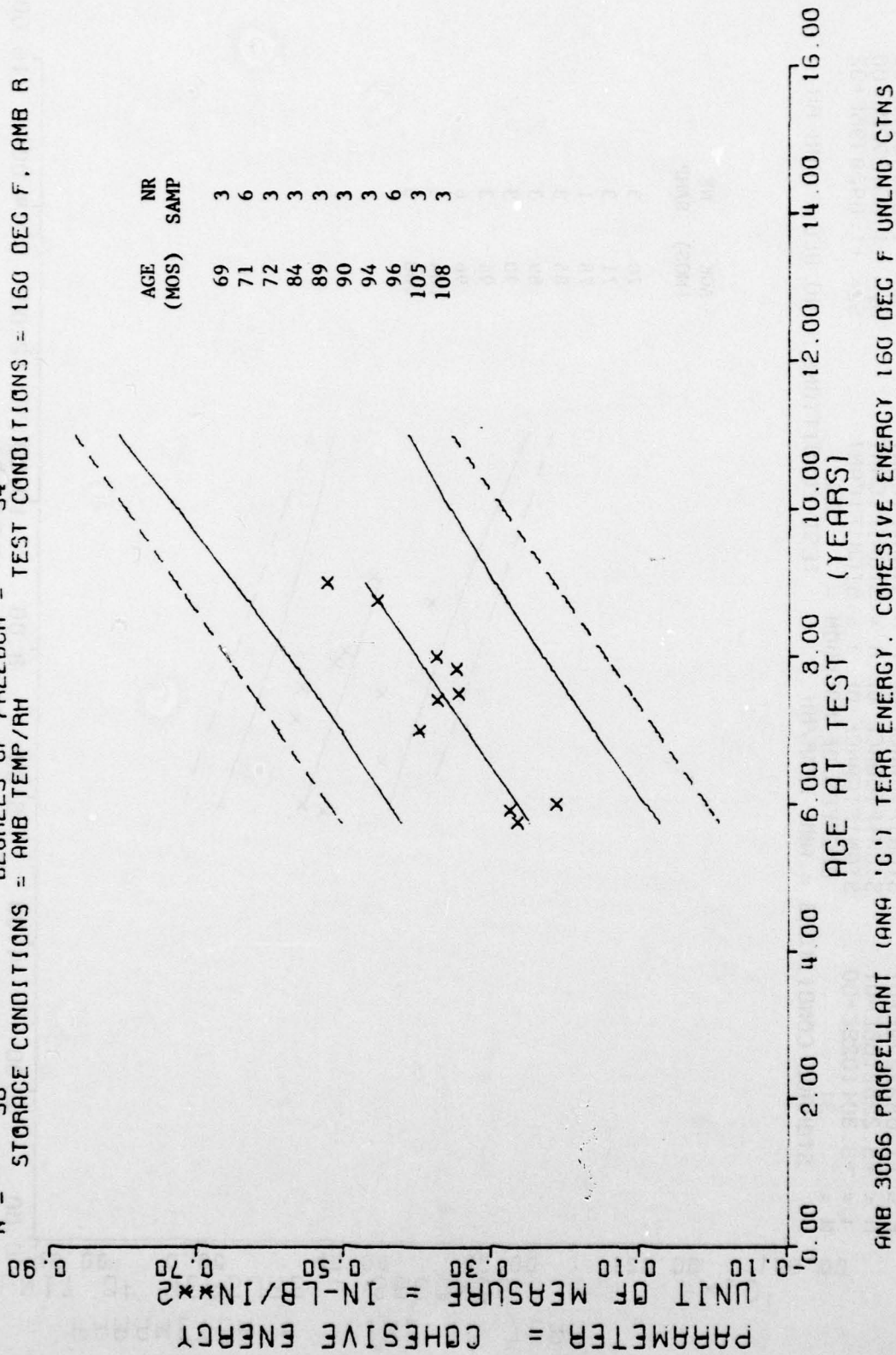
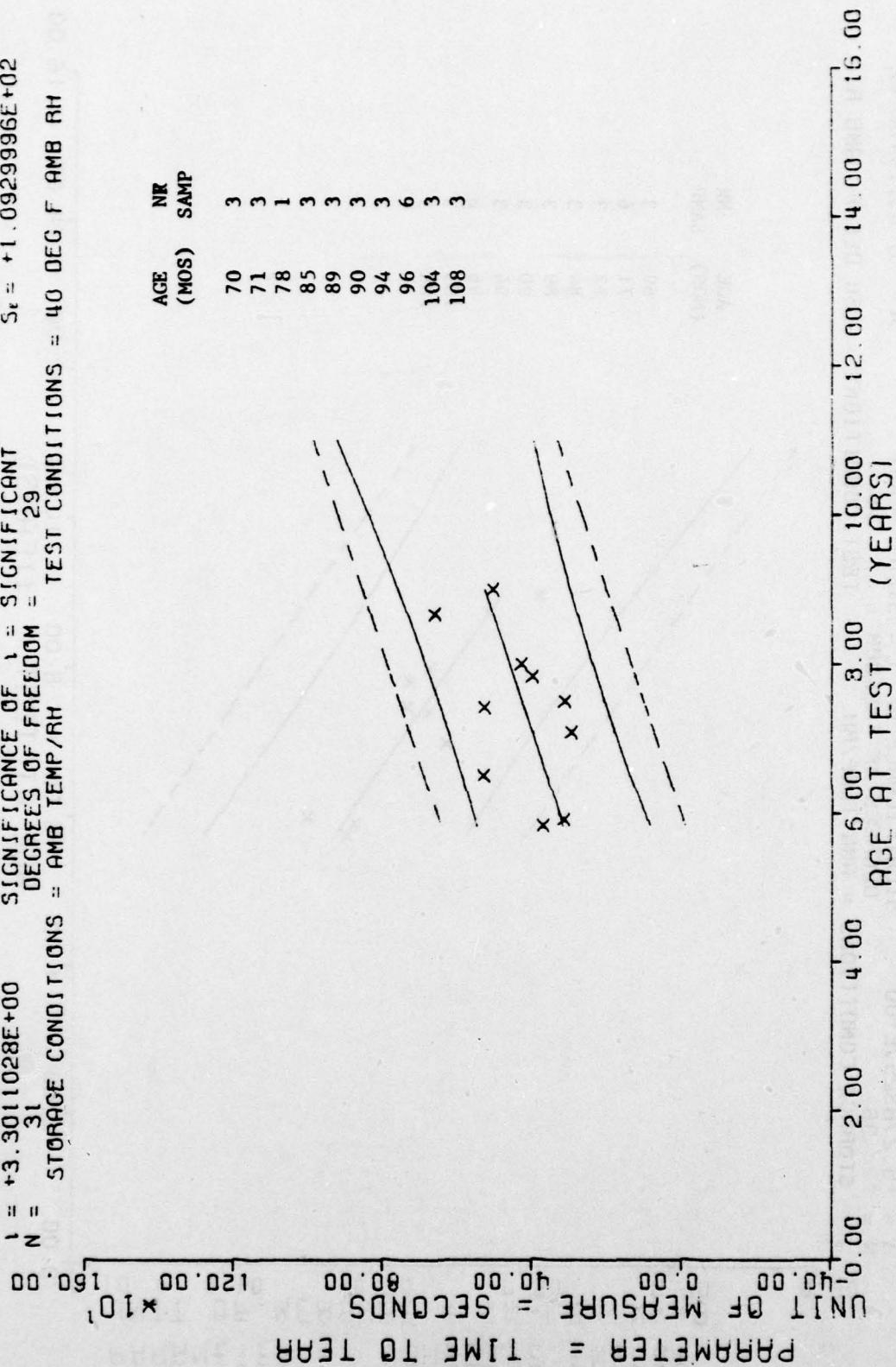


Figure 9-4

$Y = ((-6.6756862E+01) + (+5.4840304E+00) * X)$   
 $F = +1.0897279E+01$  SIGNIFICANCE OF F = SIGNIFICANT  
 $R = +5.2262166E-01$  SIGNIFICANCE OF R = SIGNIFICANT  
 $1 = +3.3011028E+00$  SIGNIFICANCE OF 1 = SIGNIFICANT  
 $N = 31$  DEGREES OF FREEDOM = 29  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 40 DEG F AMB RH

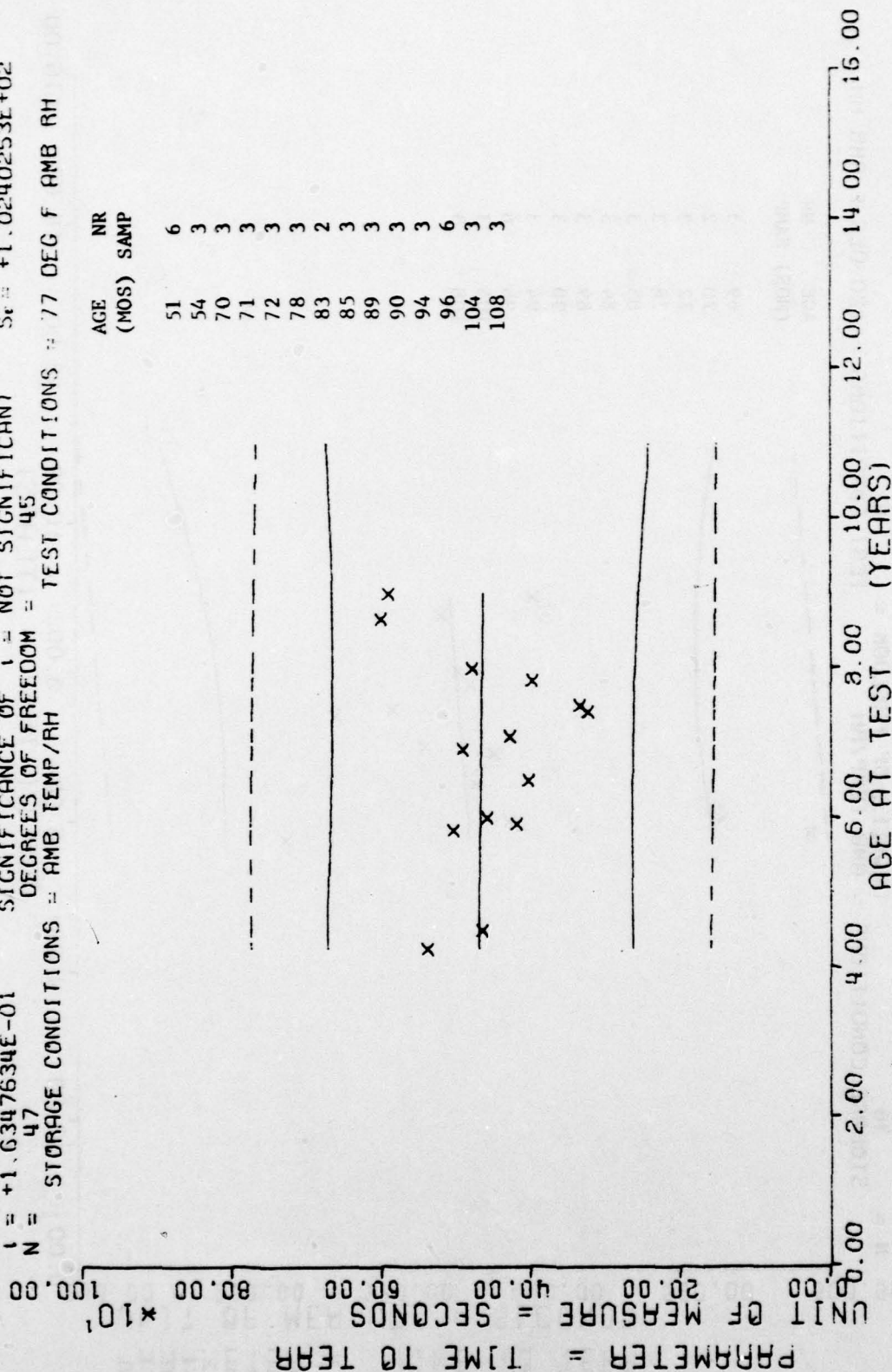


AMB 3066 PROPELLANT (ANA 'G') TEAR ENERGY, TIME TO TEAR, 40 DEG F, UNLND CTNS

Figure 9-5



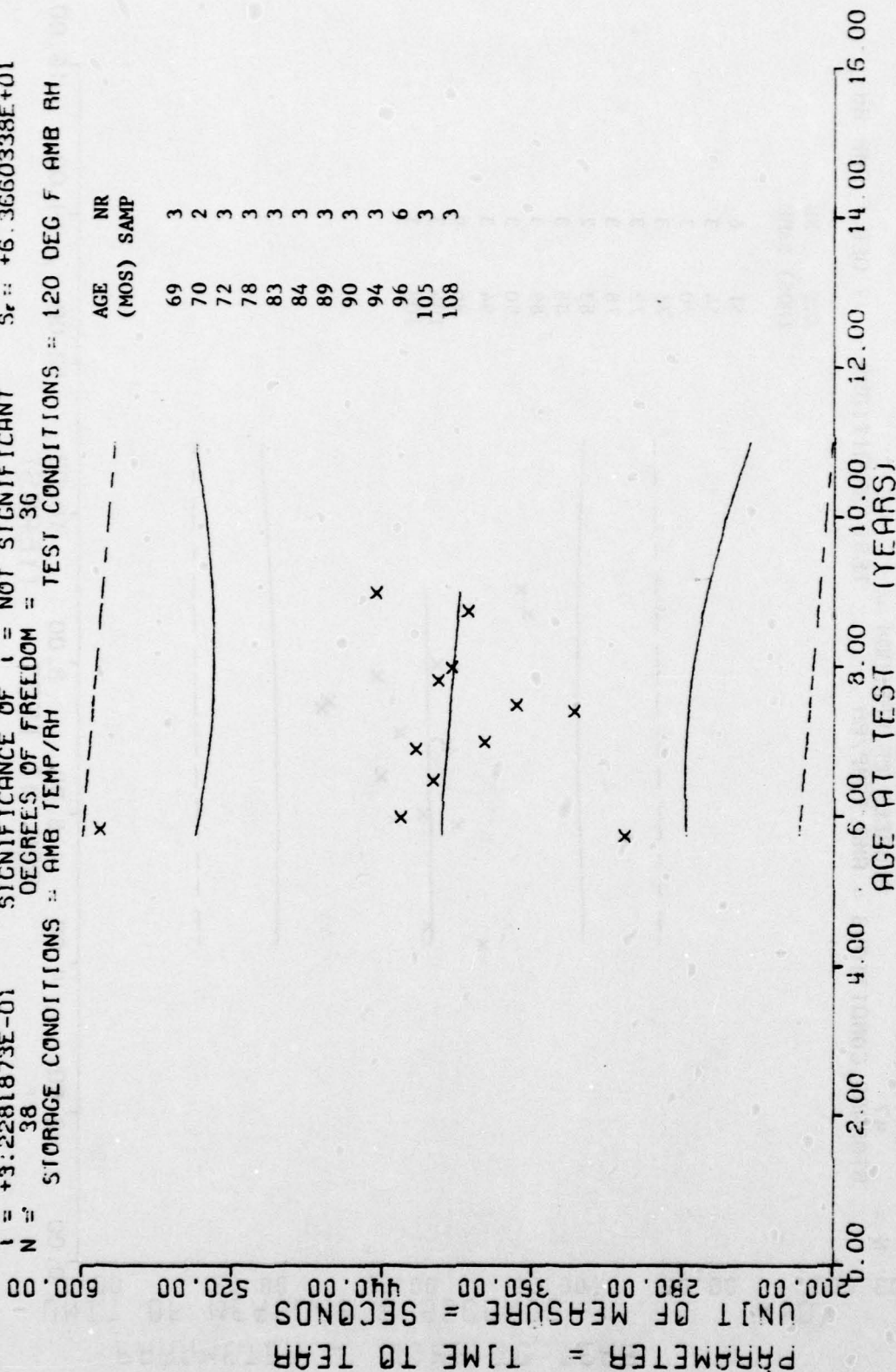
$F = +2.6724516E-02$   
 $R = -2.4362382E-02$   
 $I = +1.6347634E-01$   
 $N = 47$   
 STORAGE CONDITIONS = AMB TEMP/RH  
 DEGREES OF FREEDOM = 45  
 $Y = ((+4.7496722E+02) + (-1.3836532E-01) * X)$   
 SIGNIFICANCE OF F = NOT SIGNIFICANT  
 SIGNIFICANCE OF R = NOT SIGNIFICANT  
 SIGNIFICANCE OF I = NOT SIGNIFICANT  
 SIGNIFICANCE OF N = NOT SIGNIFICANT  
 $S_1 = +1.0131341E+02$   
 $S_2 = +8.4639354E-01$   
 $S_3 = +1.0240253E+02$   
 TEST CONDITIONS = 77 DEG F AMB RH



AMB 3066 PROPELLANT (ANA 'G') TEAR ENERGY, TIME TO TEAR, 77 DEG F, UNLNO CTNS

Figure 9-6

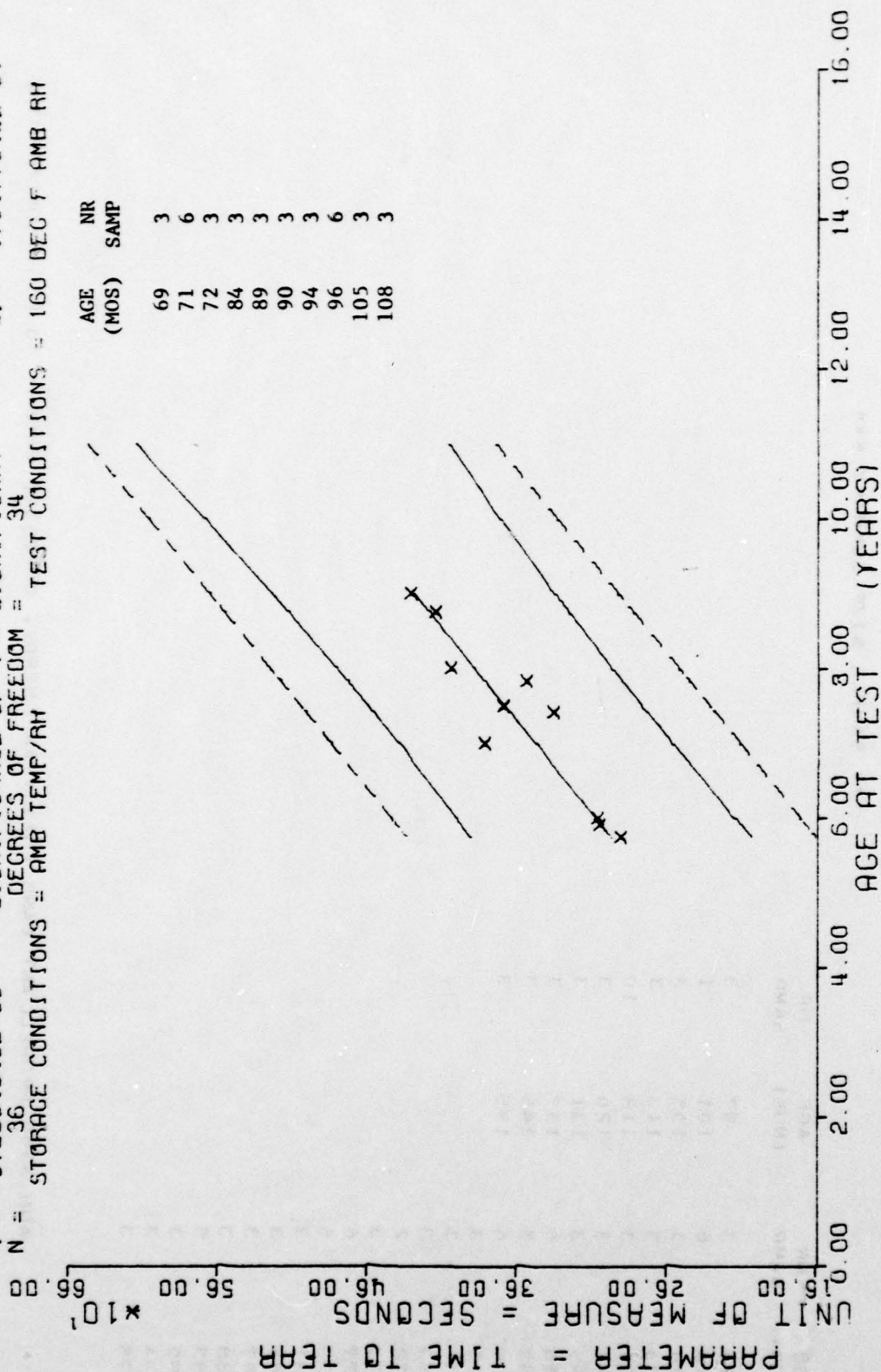
$Y = ((+4.2770717E+02) + (-2.7730268E-01) \times X)$   
 F = +1.0421193E-01 SIGNIFICANCE OF F = NOT SIGNIFICANT  $G_1 = +6.2884992E+01$   
 R = -5.3725416E-02 SIGNIFICANCE OF R = NOT SIGNIFICANT  $S_1 = +8.5900432E-01$   
 I = +3.2281873E-01 SIGNIFICANCE OF I = NOT SIGNIFICANT  $S_2 = +6.3660338E+01$   
 N = 38 DEGREES OF FREEDOM = 36  
 STORAGE CONDITIONS = AMB TEMP/AM TEST CONDITIONS = 120 DEG F AMB RH



ANB 3066 PROPELLANT (ANA 'G') TEAR ENERGY, TIME TO TEAR, 120 DEG F UNLND CTNS

Figure 9-7

$Y = ((+6.4236414E+01) + (+3.3766823E+00) * X)$   
 $F = +3.4052290E+01$  SIGNIFICANCE OF F = SIGNIFICANT  
 $R = +7.0737839E-01$  SIGNIFICANCE OF R = SIGNIFICANT  
 $t = +5.8354340E+00$  SIGNIFICANCE OF t = SIGNIFICANT  
 $N = 36$  DEGREES OF FREEDOM = 34  
 STORAGE CONDITIONS = AMB TEMP/RY TEST CONDITIONS = 160 DEG F AMB RH



AMB 3066 PROPELLANT (ANA 'C') TEAR ENERGY, TIME TO TEAR, 160 DEG F UNLND CTNS

Figure 9-8

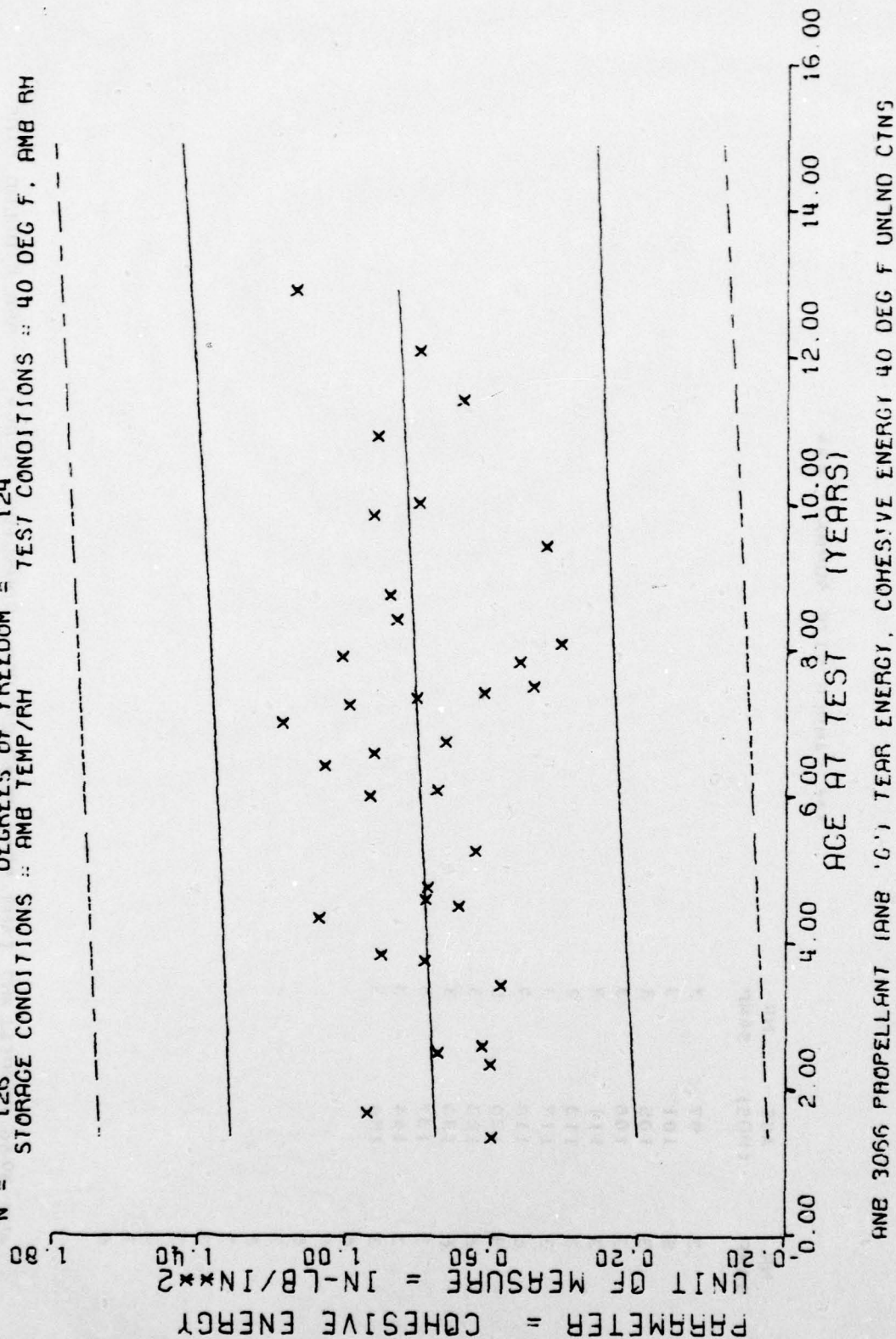


\*\*\* SAMPLE SIZE SUMMARY \*\*\*

AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP
16	3	97	3
20	6	101	1
28	3	105	3
30	3	113	3
31	3	118	10
41	3	120	3
45	3	131	3
46	6	137	3
52	3	145	3
54	6	155	3
55	3		
57	3		
63	3		
72	2		
73	3		
77	6		
79	6		
81	3		
84	3		
87	3		
89	3		
93	5		
90	3		
94	3		
95	3		

AMR 3066 PROPELLANT (AMR 90) TEAR ENERGY, COHESIVE ENERGY 40 DEG F UNLND CTNS

$Y = ((+7.4635729E-01) + (+7.6558349E-04) * X)$   
 $F = +9.9621768E-01$  SIGNIFICANCE OF F = NOT SIGNIFICANT  $S_r = +3.0462546E-01$   
 $R = +8.9274759E-02$  SIGNIFICANCE OF R = NOT SIGNIFICANT  $S_s = +7.6703545E-04$   
 $t = +9.9810705E-01$  SIGNIFICANCE OF t = NOT SIGNIFICANT  $S_t = +3.0463007E-01$   
 $N = 126$  DEGREES OF FREEDOM = 124  
 STORAGE CONDITIONS :: AMB TEMP/RH TEST CONDITIONS :: 40 DEG F, AMB RH



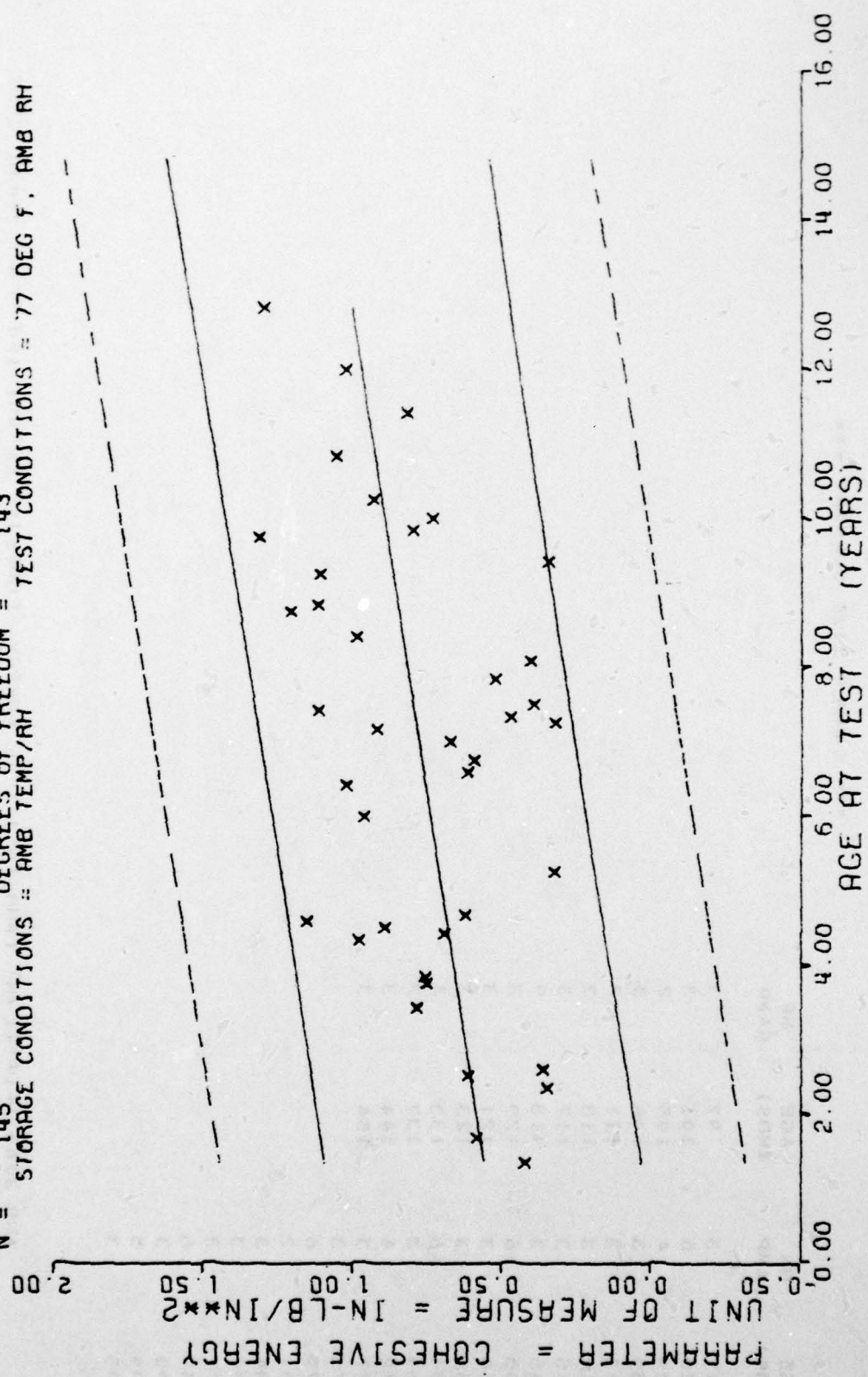
\*\*\* SAMPLE SIZE SUMMARY \*\*\*

AGE ( MOS)	NR SAMP	AGE ( MOS)	NR SAMP
16	3	97	3
20	5	101	3
28	3	105	3
30	3	106	3
31	3	111	3
41	3	113	2
45	3	117	3
46	6	118	9
52	3	120	5
53	3	123	3
54	6	130	3
55	3	137	3
56	3	144	3
63	3	154	3
72	6		
77	6		
79	6		
81	3		
84	3		
85	3		
87	3		
89	3		
89	3		
90	3		
94	6		

AIR 3066 PROPELLANT (AIR 100) TEAR ENERGY, COMESIVE ENERGY 77 DEG F UPLND CTNG



Y = (( +5.1310962E-01 ) + ( +3.1965882E-03 ) \* X)  
 F = +2.0400935E+01 SIGNIFICANCE OF F = SIGNIFICANT G = +3.1354258E-01  
 R = +3.5334404E-01 SIGNIFICANCE OF R = SIGNIFICANT S<sub>e</sub> = +7.0772029E-04  
 I = +4.5167394E+00 SIGNIFICANCE OF I = SIGNIFICANT S<sub>e</sub> = +2.9434082E-01  
 N = 145 DEGREES OF FREEDOM = 143  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 77 DEG F, AMB RH



AMB 3056 PROPELLANT (AMB 'G') TEAR ENERGY, COHESIVE ENERGY 77 DEG F UNLND CTNS

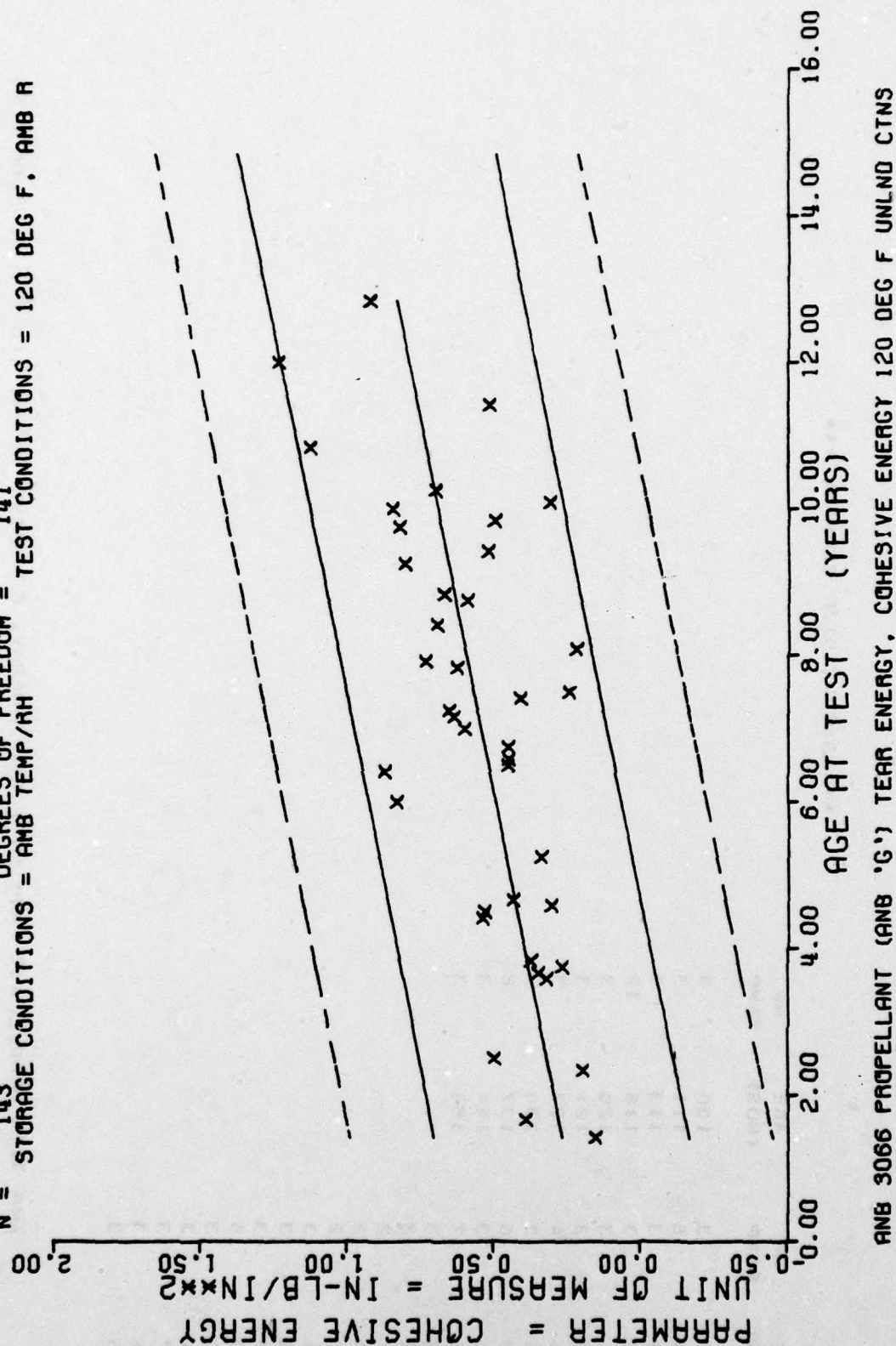
Figure 9-10

\*\*\* SAMPLE SIZE SUMMARY \*\*\*

AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP
17	3	97	3
20	6	101	3
29	4	105	2
30	3	106	3
43	3	111	3
44	3	113	3
45	3	117	3
46	3	118	9
53	6	120	3
54	3	121	3
55	3	123	3
55	6	130	3
63	3	137	3
72	4	144	3
77	3	154	3
79	3		
79	6		
91	2		
84	3		
86	3		
87	3		
89	6		
90	3		
94	5		
95	3		

ANR 3066 PROPELLANT (ANR 060) TEST ENERGY, COMBUSTIVE ENERGY 120 DEG F UNLND CTHS

$Y = ((+2.0061127E-01) + (+4.117800E-03) \times X)$   
 $F = +5.0054306E+01$  SIGNIFICANCE OF F = SIGNIFICANT  $\sigma = +2.7943900E-01$   
 $R = +5.1184953E-01$  SIGNIFICANCE OF R = SIGNIFICANT  $S_e = +5.8117798E-04$   
 $t = +7.0749068E+00$  SIGNIFICANCE OF t = SIGNIFICANT  $S_t = +2.4090886E-01$   
 $N = 143$  DEGREES OF FREEDOM = 141  
 STORAGE CONDITIONS = AMB TEMP/AH TEST CONDITIONS = 120 DEG F, AMB R



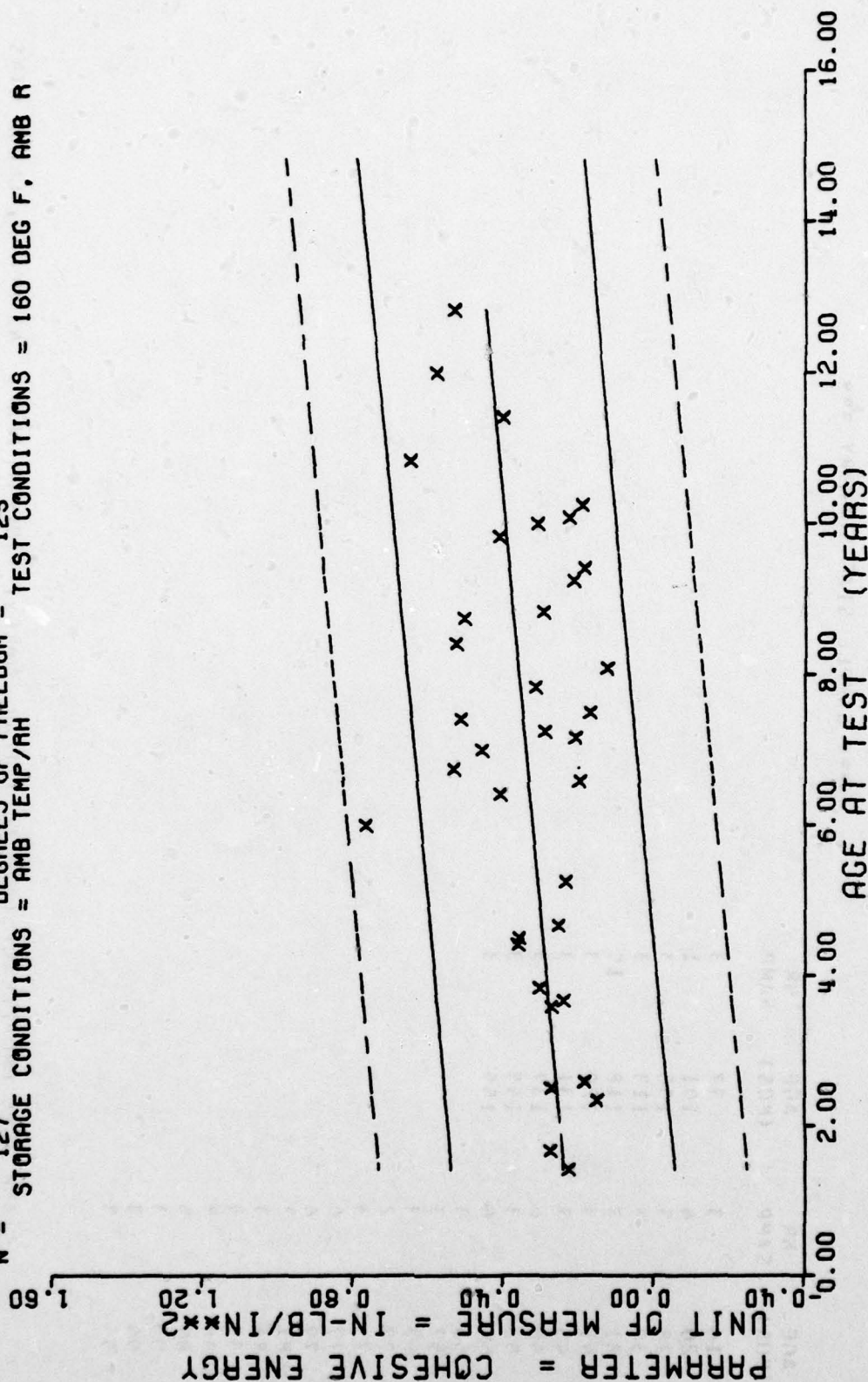


\*\*\* SAMPLE SIZE SUMMARY \*\*\*

AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP
17	3	106	3
20	6	111	3
23	3	113	3
30	3	118	12
31	3	120	3
43	3	121	3
44	4	123	3
45	3	130	3
53	6	137	2
54	3	144	3
55	7	154	3
63	3		
72	3		
77	2		
79	2		
91	2		
94	3		
96	3		
97	3		
99	6		
99	3		
94	3		
97	3		
101	3		
105	3		

ANR 3266 PROPELLANT (ANR 1G1) TEAP ENERGY, COHESIVE ENERGY 140 DEG F UNLND CTNS

$Y = ((+2.1577288E-01) + (+1.5074558E-03) \times X)$   
 $F = +1.4270642E+01$  SIGNIFICANCE OF F = SIGNIFICANT  $\sigma = +1.7260525E-01$   
 $R = +3.2010464E-01$  SIGNIFICANCE OF R = SIGNIFICANT  $S_e = +3.9904589E-04$   
 $t = +3.7776503E+00$  SIGNIFICANCE OF t = SIGNIFICANT  $S_e = +1.6417593E-01$   
 $N = 127$  DEGREES OF FREEDOM = 125  
 STORAGE CONDITIONS = AMB TEMP/AH TEST CONDITIONS = 160 DEG F, AMB R



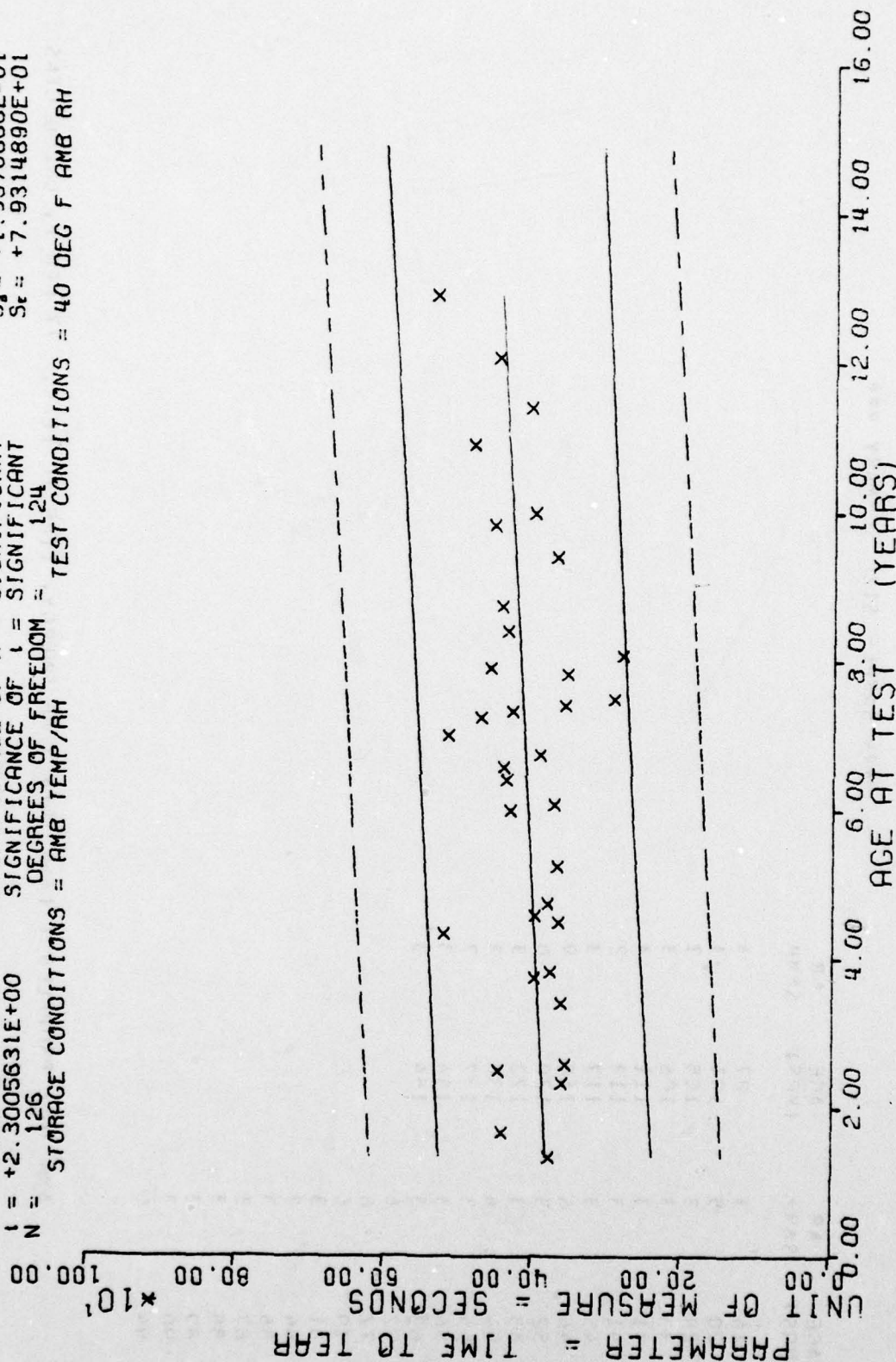
\*\*\* SAMPLE SIZE SUMMARY \*\*\*

AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP
16	3	97	3
20	6	101	1
28	3	105	3
30	3	113	3
31	3	118	10
41	3	120	3
45	3	131	3
46	6	137	3
52	3	145	3
54	6	155	3
55	3		
57	3		
63	3		
72	2		
73	3		
77	6		
79	6		
81	3		
94	3		
97	3		
98	2		
89	5		
93	3		
94	3		
95	3		

AND 306% PROPELLANT (AND 6%) TEAR ENERGY, TIME TO TEAR, 40 DEG F, UNALND CTNS



$F = +5.2925910E+00$   
 $R = +2.0232397E-01$   
 $I = +2.3005631E+00$   
 $N = 126$   
 STORAGE CONDITIONS = AMB TEMP/AMH  
 $Y = ((+3.756441E+02) + (+4.5944291E-01) * X)$   
 SIGNIFICANCE OF F = SIGNIFICANT  
 SIGNIFICANCE OF R = SIGNIFICANT  
 SIGNIFICANCE OF I = SIGNIFICANT  
 DEGREES OF FREEDOM = 124  
 TEST CONDITIONS = 40 DEG F AMB RH  
 $G_r = +8.0665260E+01$   
 $S_g = +1.9970888E-01$   
 $S_r = +7.9314890E+01$



ANB 3066 PROPELLANT (AMB 'C') TEAR ENERGY, TIME TO TEAR, 40 DEG F, UNLND CTNS

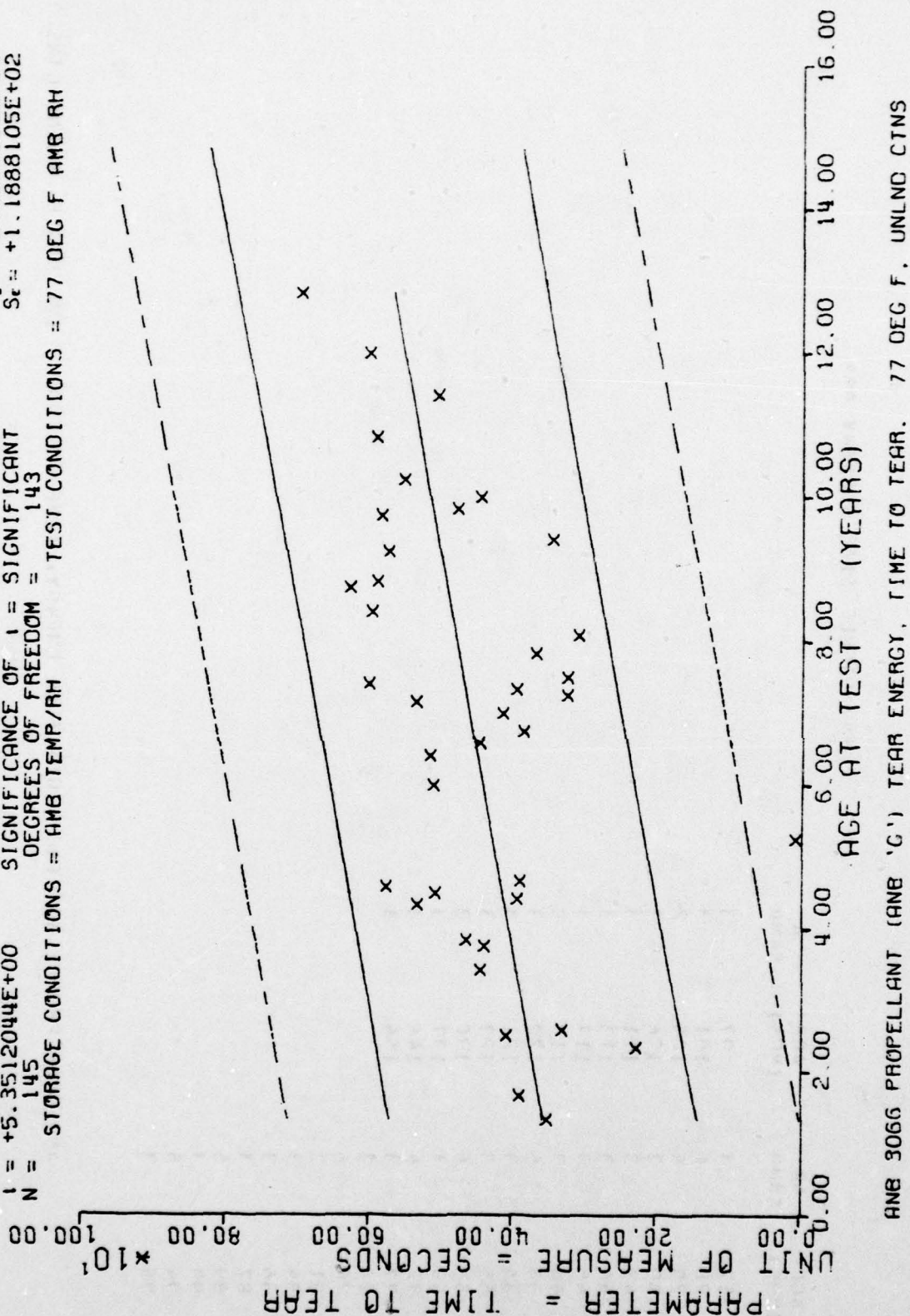
Figure 9-13

\*\*\* SAMPLE SIZE SUMMARY \*\*\*

AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP
16	3	97	3
20	5	101	3
24	3	105	3
30	3	106	3
31	3	111	3
41	3	113	2
45	3	117	3
46	6	118	9
52	3	120	6
53	3	122	3
54	6	130	3
55	3	137	3
56	3	144	3
63	3	154	3
72	6		
77	6		
79	6		
81	3		
84	3		
86	3		
87	3		
88	3		
87	3		
90	3		
94	6		

AMB 3046 PROPELLANT (AMB 900) TEAR ENERGY, TIME TO TEAR, 77 DEG F, UNLHD CTAS

$Y = ((+3.3311173E+02) + (+1.5295910E+00) * X)$   
 F = +2.8635389E+01 SIGNIFICANCE OF F = SIGNIFICANT  $G_r = +1.2978808E+02$   
 R = +4.0845867E-01 SIGNIFICANCE OF R = SIGNIFICANT  $S_r = +2.8584052E-01$   
 I = +5.3512044E+00 SIGNIFICANCE OF I = SIGNIFICANT  $S_t = +1.1888105E+02$   
 N = 145 DEGREES OF FREEDOM = 143  
 STORAGE CONDITIONS = AMB TEMP/AM TEST CONDITIONS = 77 DEG F AMB RH



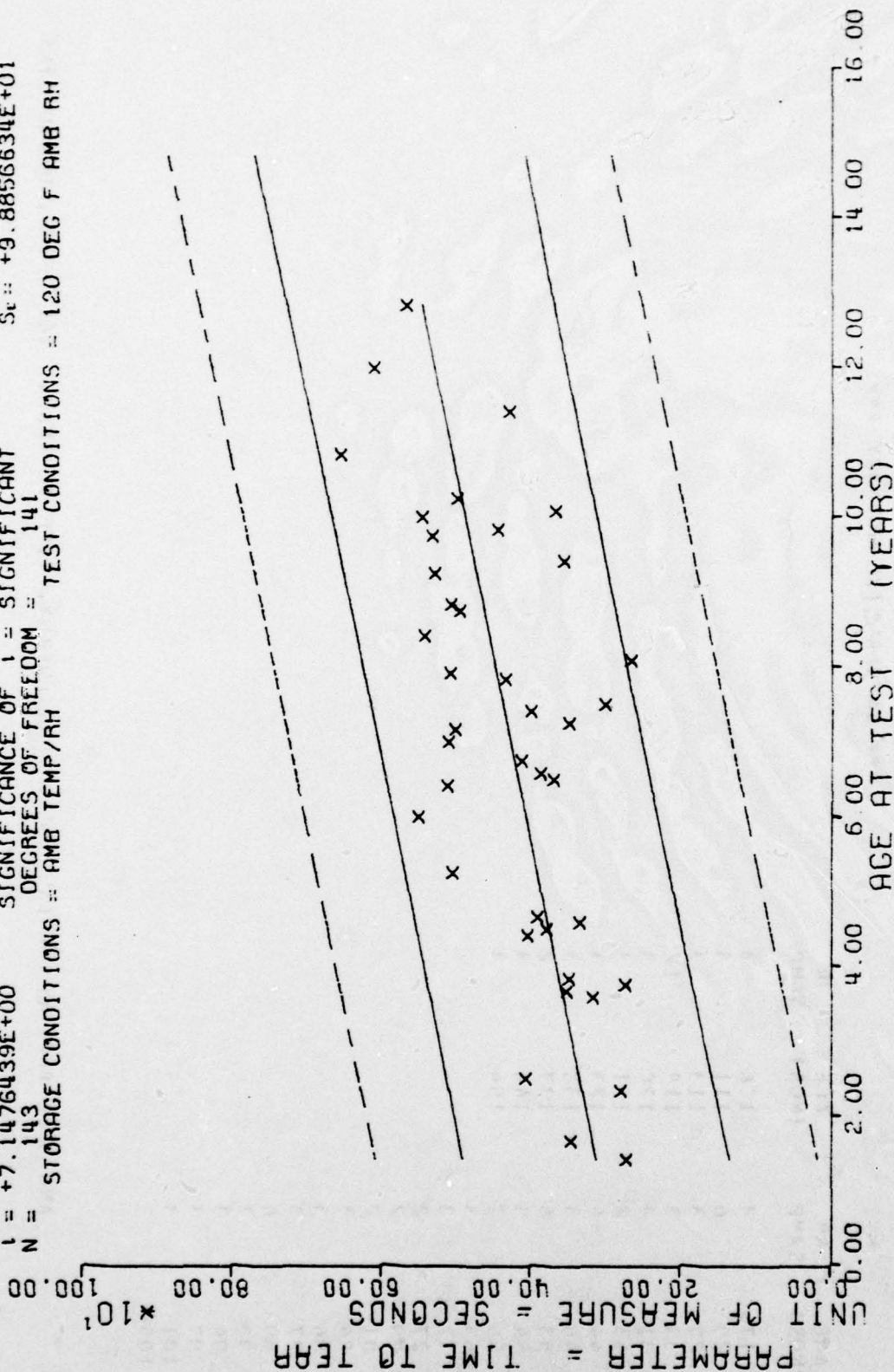


\*\*\* SAMPLE SIZE SUMMARY \*\*\*

AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP
17	3	97	3
20	6	101	3
29	4	105	2
30	2	106	3
43	3	111	3
44	3	113	3
45	3	117	3
46	3	118	5
53	6	120	3
54	3	121	3
55	3	123	3
56	6	130	3
63	3	137	3
72	4	144	3
77	3	154	3
79	3		
79	6		
81	2		
84	3		
86	3		
87	3		
89	5		
90	3		
94	5		
95	3		

AND 3066 PROPELLANT (AIR-G) TEAR ENERGY, TIME TO TEAR, 120 DEG F, UNLND CINS

$Y = ((+2.8437968E+02) + (+1.7046102E+00) * X)$   
 $F = +5.1088813E+01$  SIGNIFICANCE OF F = SIGNIFICANT  $G_1 = +1.1497745E+02$   
 $R = +5.1571750E-01$  SIGNIFICANCE OF R = SIGNIFICANT  $S_1 = +2.3848561E-01$   
 $l = +7.1476439E+00$  SIGNIFICANCE OF l = SIGNIFICANT  $S_t = +9.8856634E+01$   
 $N = 143$  DEGREES OF FREEDOM = 141  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 120 DEG F AMB RH



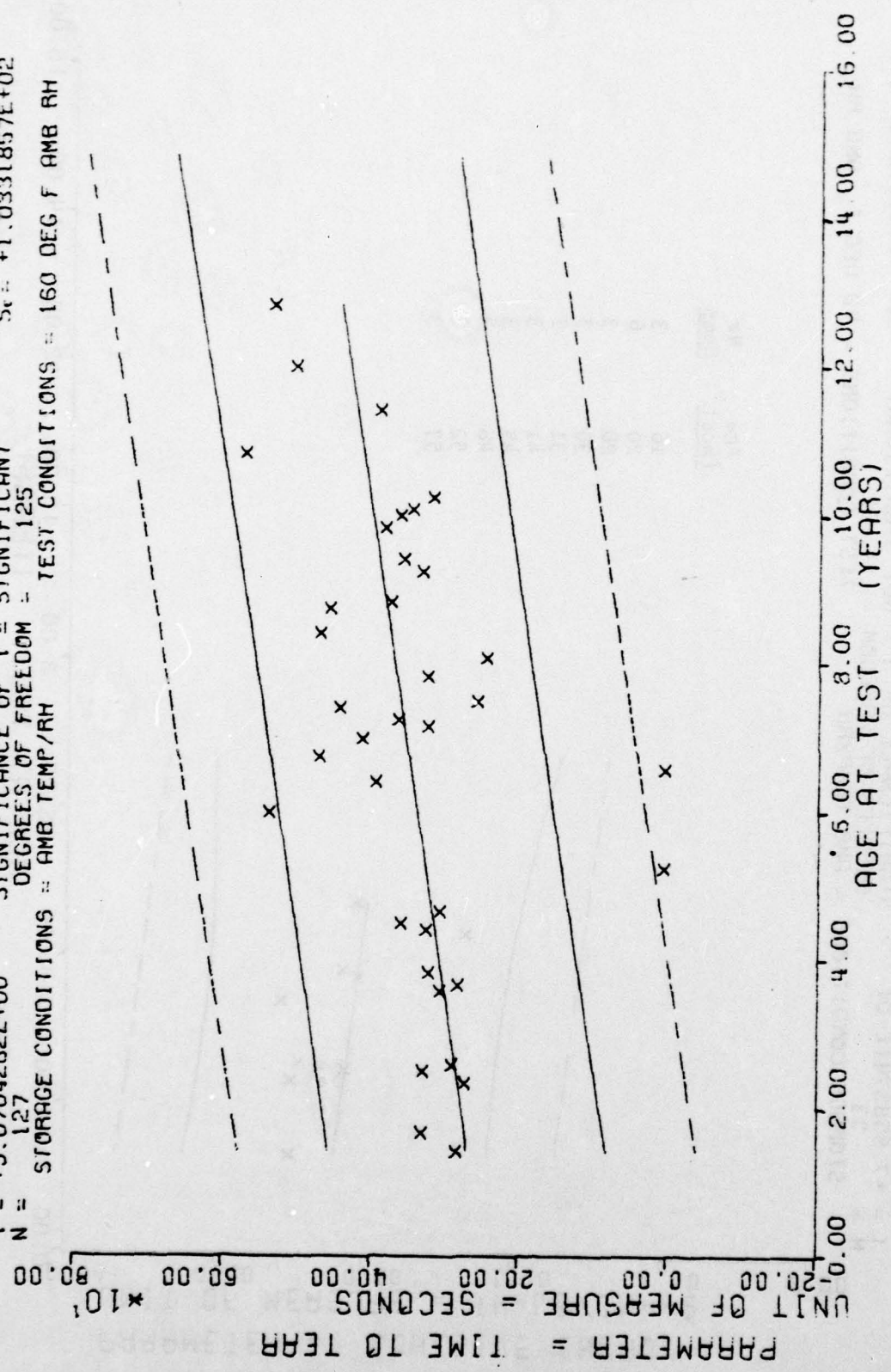
\*\*\* SAMPLE SIZE SUMMARY \*\*\*

AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP
17	3	106	3
20	6	111	3
28	3	113	3
30	3	119	12
31	3	120	3
43	3	121	2
44	4	123	3
46	3	130	3
53	6	137	2
54	3	144	3
56	7	154	3
63	3		
72	3		
77	2		
79	2		
81	2		
84	3		
86	3		
87	3		
89	6		
90	3		
94	3		
97	3		
101	3		
105	3		

AND 3766. PERFLUANT (MOS 95) YEAR ENERGY, TIME TO TEAR, 160 DEG F, UNLND CINS



$Y = ((+2.4794901E+02) + (+1.2733160E+00) \times X)$   
 $F = +2.5709222E+01$  SIGNIFICANCE OF F = SIGNIFICANT  $G_1 = +1.1299599E+02$   
 $R = +4.1302330E-01$  SIGNIFICANCE OF R = SIGNIFICANT  $S_1 = +2.5112602E-01$   
 $I = +5.0704262E+00$  SIGNIFICANCE OF I = SIGNIFICANT  $S_2 = +1.0331857E+02$   
 $N = 127$  DEGREES OF FREEDOM = 125  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 160 DEG F AMB RH



AMB 3066 PROPELLANT (AMB 'C') TEAR ENERGY. TIME TO TEAR, 160 DEG F, UNLNO CTNS

Figure 9-16

$Y = ((+6.9433531E-01) + (+2.0400125E-03) * X)$   
 $F = +6.1754043E-01$  SIGNIFICANCE OF F = NOT SIGNIFICANT  $G = +1.9639513E-01$   
 $R = +1.3975541E-01$  SIGNIFICANCE OF R = NOT SIGNIFICANT  $S = +2.5959728E-03$   
 $I = +7.8583741E-01$  SIGNIFICANCE OF I = NOT SIGNIFICANT  $S_t = +1.9757940E-01$   
 $N = 33$  DEGREES OF FREEDOM = 31  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 40 DEG F, AMB RH

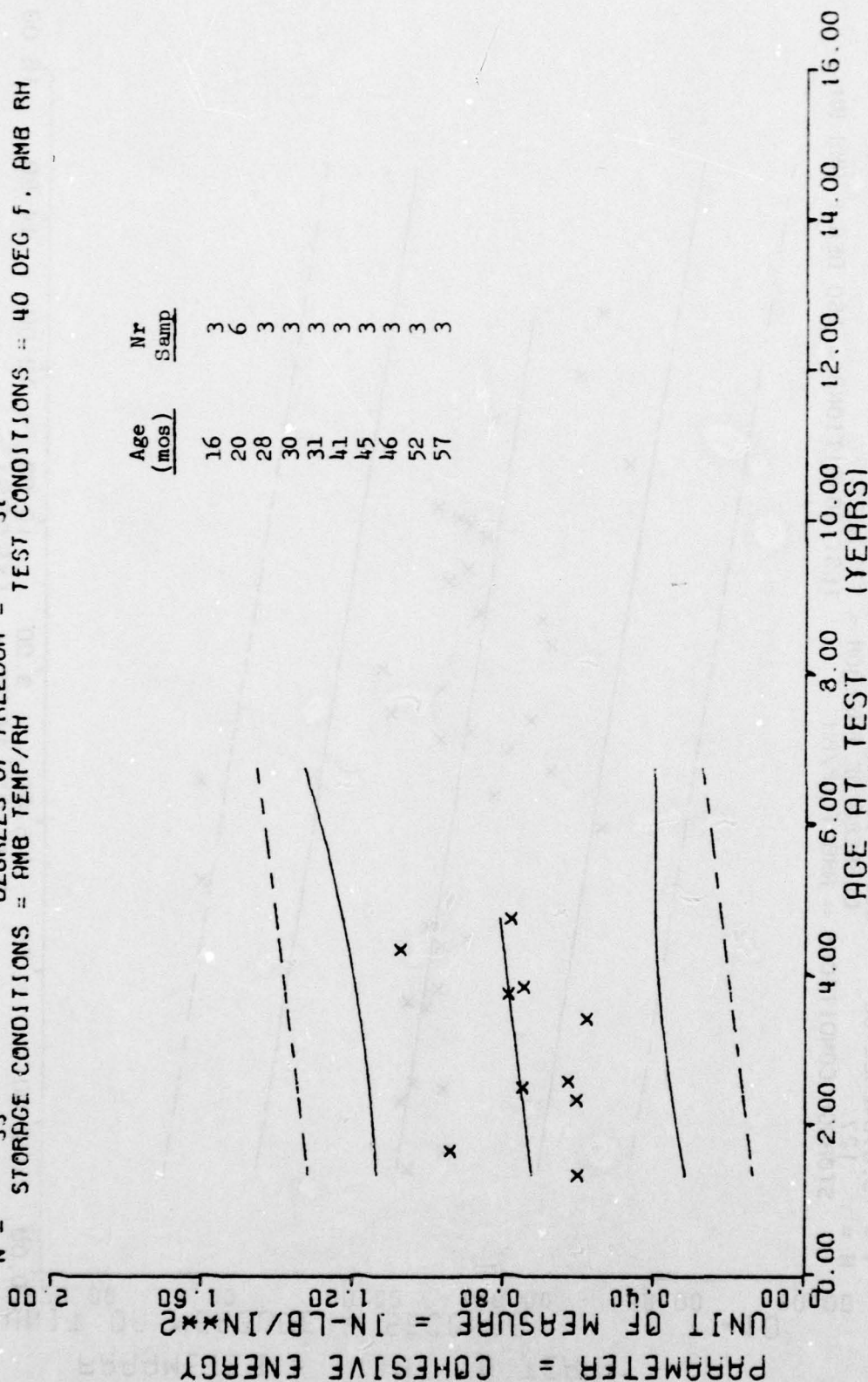
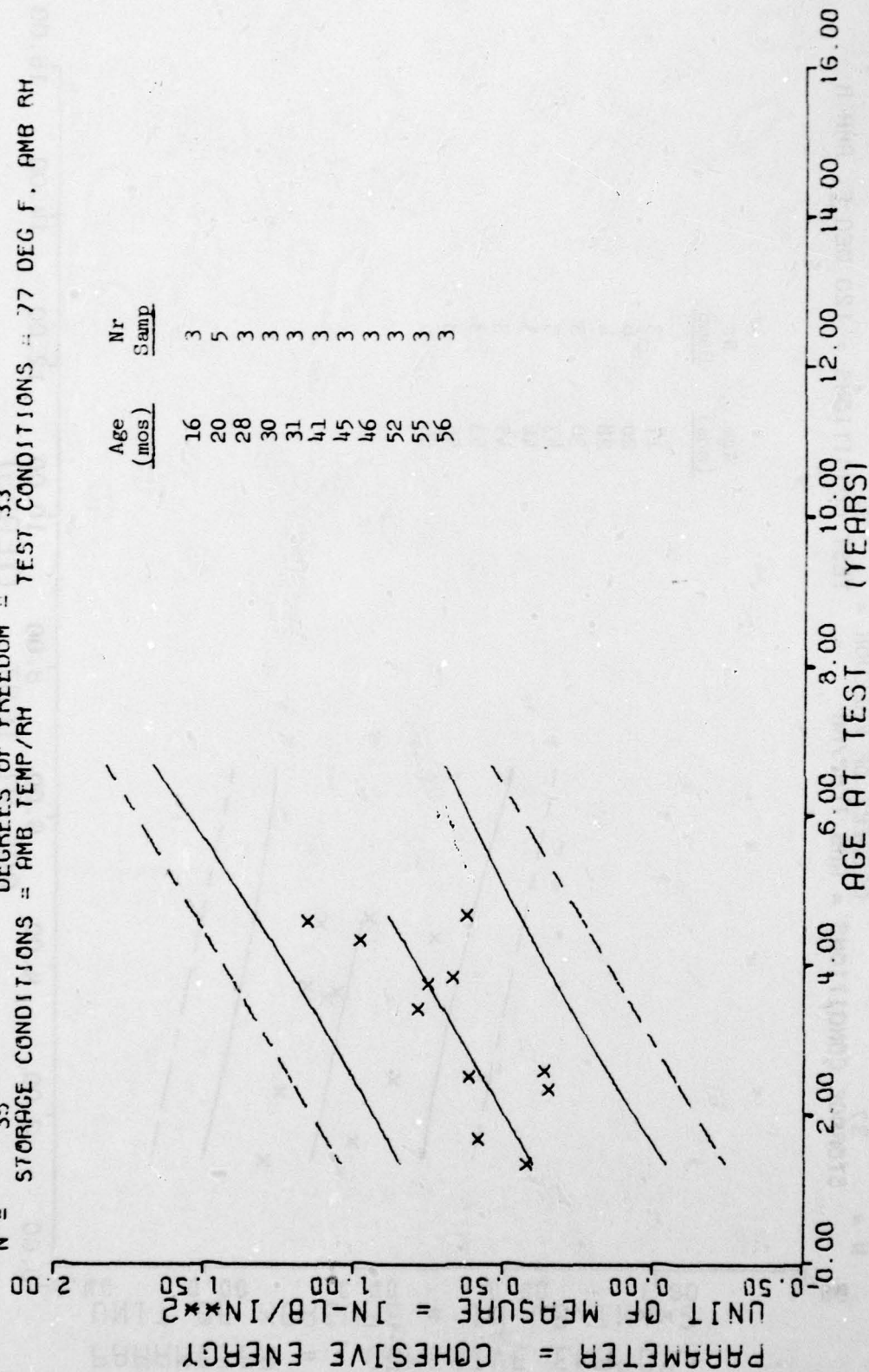


Figure 9-17

Y = (( +2.0595307E-01 ) + ( +1.2186109E-02 ) \* X)  
 F = +2.0909083E+01 SIGNIFICANCE OF F = SIGNIFICANT  
 R = +6.2278267E-01 SIGNIFICANCE OF R = SIGNIFICANT  
 S = +4.5726451E+00 SIGNIFICANCE OF S = SIGNIFICANT  
 N = 35 DEGREES OF FREEDOM = 33  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 77 DEG F, AMB RH

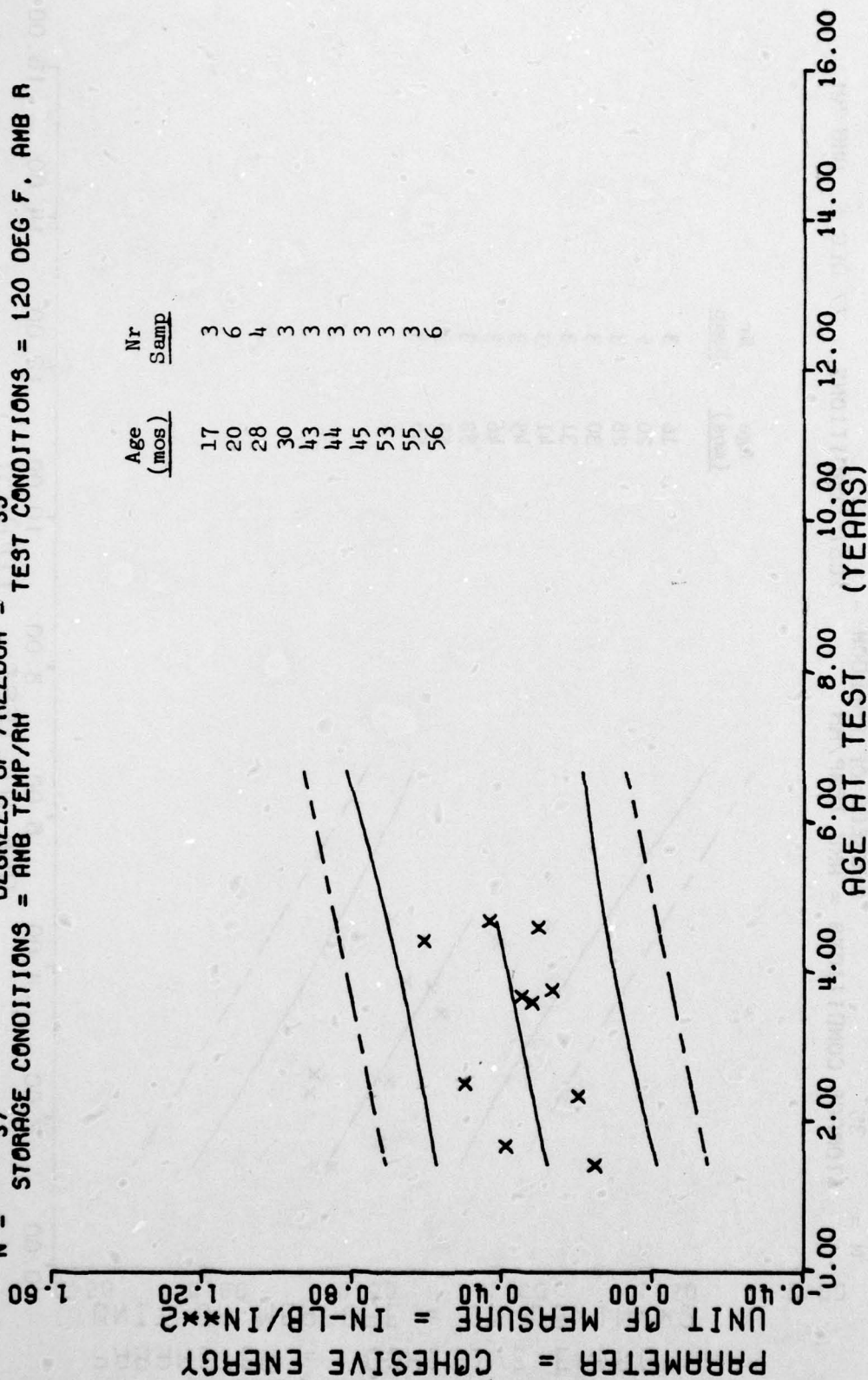


ANB 3066 PROPELLANT (ANB 'C') TEAR ENERGY, COHESIVE ENERGY 77 DEG F LINED CTNS

Figure 9-18



$Y = 1 ( +2.2540729E-01 ) + ( +3.4139469E-03 ) \times X$   
 $F = +4.3307050E+00$  SIGNIFICANCE OF  $F =$  SIGNIFICANT  $\alpha = +1.5008123E-01$   
 $R = +3.3182831E-01$  SIGNIFICANCE OF  $R =$  SIGNIFICANT  $S_e = +1.6405046E-03$   
 $t = +2.0810346E+00$  SIGNIFICANCE OF  $t =$  SIGNIFICANT  $S_e = +1.4358589E-01$   
 $N = 37$  DEGREES OF FREEDOM = 35  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 120 DEG F, AMB R



ANB 3066 PROPELLANT (ANB 'G') TEAR ENERGY, COHESIVE ENERGY 120 DEG F LINED CTNS

Figure 9-19

$Y = ((+2.2930949E-01) + (+3.0986695E-04) \times X)$   
 $F = +1.4540024E-01$  SIGNIFICANCE OF F = NOT SIGNIFICANT  $\sigma_r = +6.727917E-02$   
 $R = +6.6232467E-02$  SIGNIFICANCE OF R = NOT SIGNIFICANT  $s_e = +8.1262974E-04$   
 $t = +3.8131383E-01$  SIGNIFICANCE OF t = NOT SIGNIFICANT  $s_e = +6.8139723E-02$   
 $N = 35$  DEGREES OF FREEDOM = 33  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 160 DEG F, AMB-B

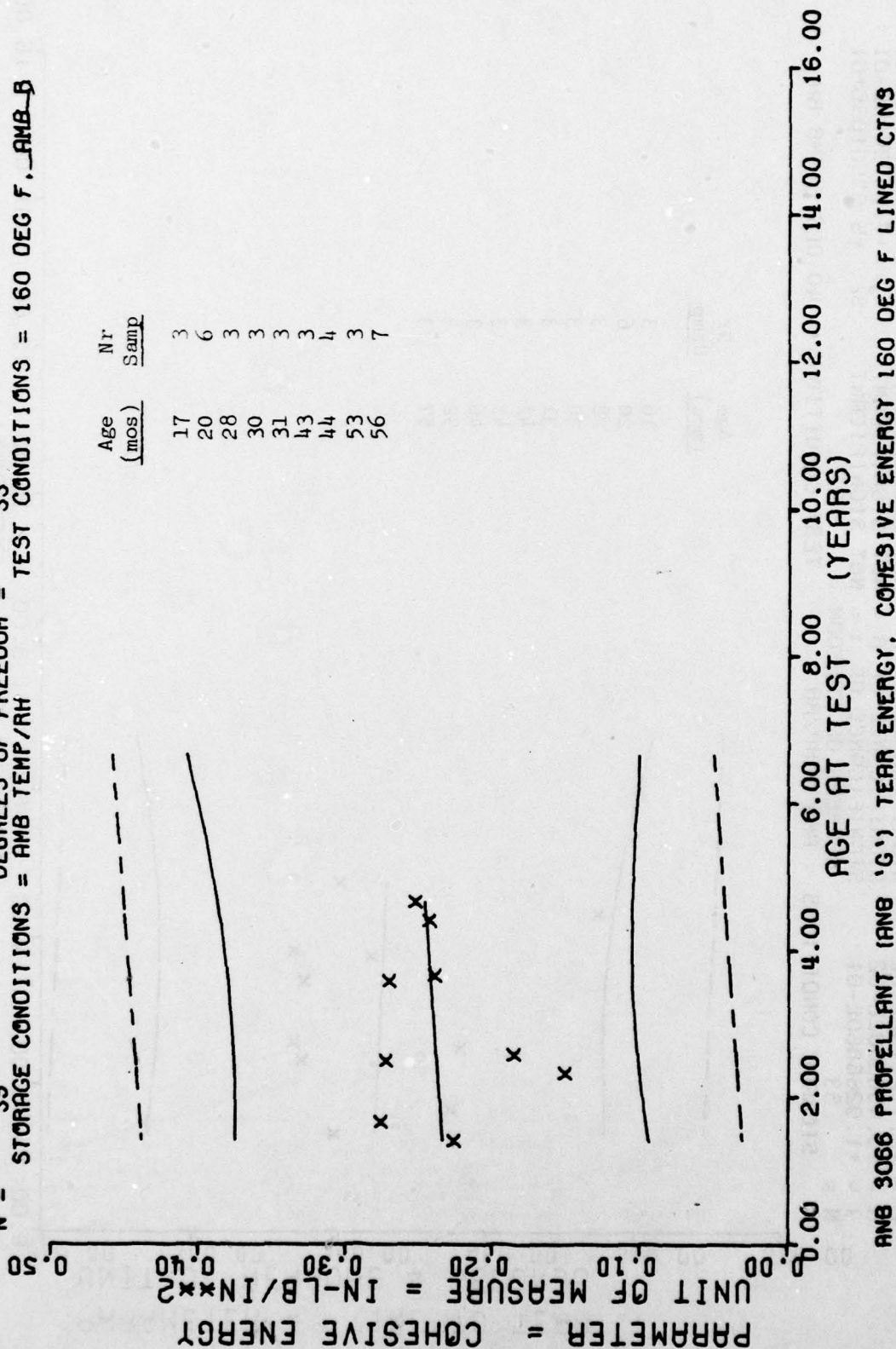


Figure 9-20

$Y = ((+3.9848121E+02) + (+1.5024183E-01) \times X)$   
 $F = +3.7121190E-02$  SIGNIFICANCE OF F = NOT SIGNIFICANT  $\sigma_r = +5.8450362E+01$   
 $R = +3.4583602E-02$  SIGNIFICANCE OF R = NOT SIGNIFICANT  $S_d = +7.7979409E-01$   
 $t = +1.9266860E-01$  SIGNIFICANCE OF t = NOT SIGNIFICANT  $S_e = +5.9350103E+01$   
 $N = 33$  DEGREES OF FREEDOM = 31  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 40 DEG F AMB RH

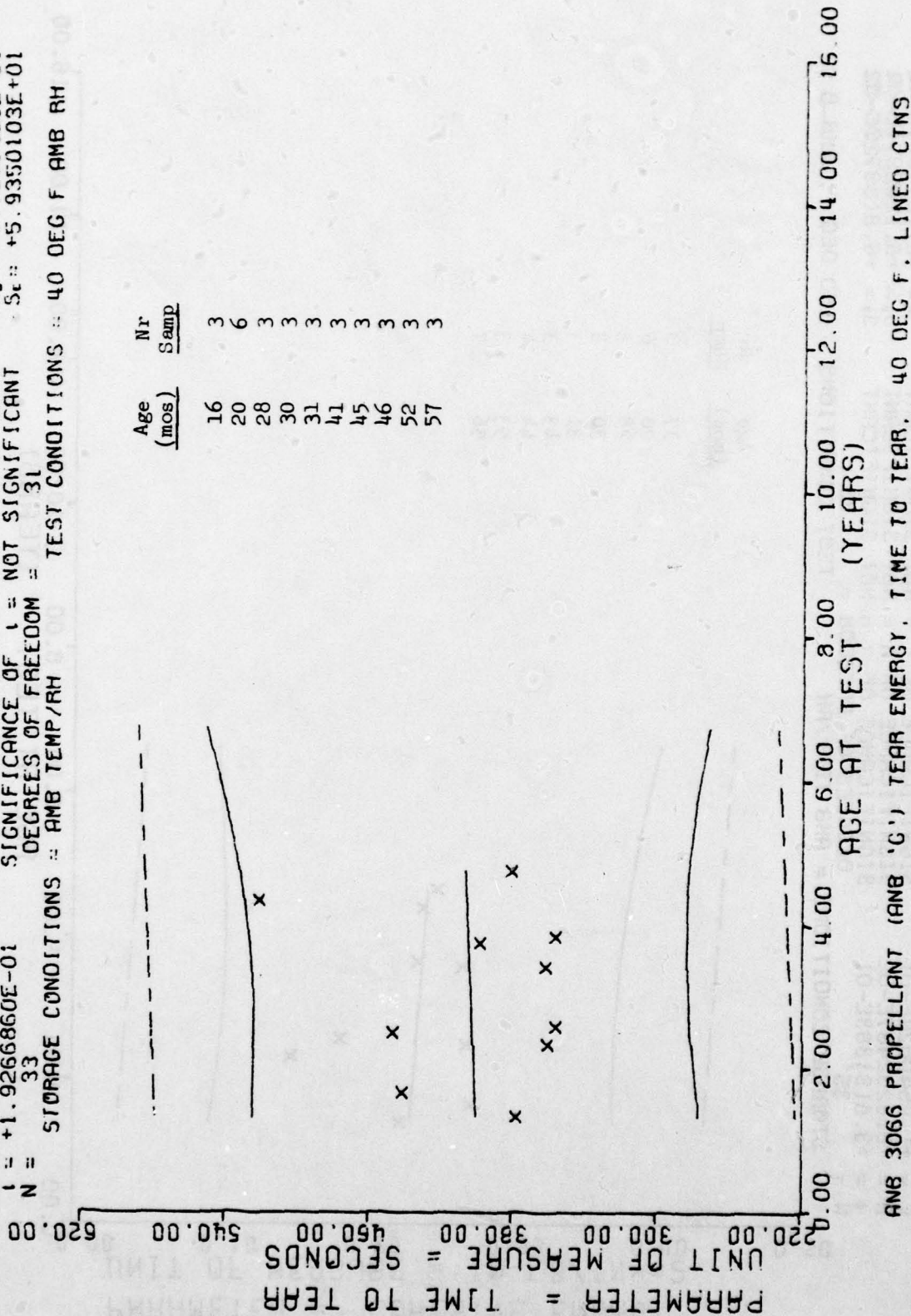
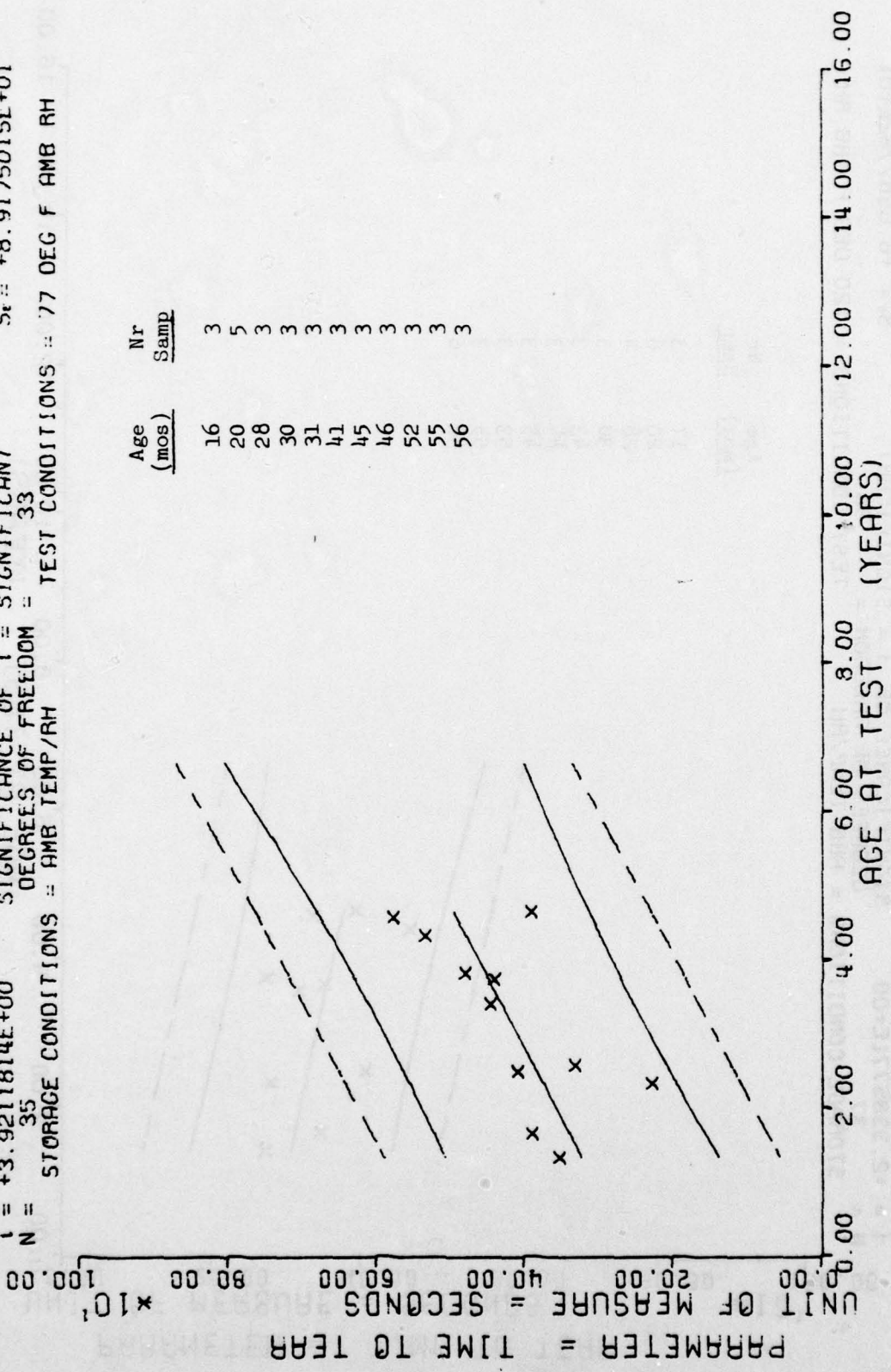


Figure 9-21



$Y = ((+2.5288989E+02) + (+4.3444028E+00) * X)$   
 $F = +1.5375664E+01$  SIGNIFICANCE OF F = SIGNIFICANT  $\sigma_r = +1.0636952E+02$   
 $R = +5.6377196E-01$  SIGNIFICANCE OF R = SIGNIFICANT  $S_b = +1.1079321E+00$   
 $I = +3.9211814E+00$  SIGNIFICANCE OF I = SIGNIFICANT  $S_t = +8.9175015E+01$   
 $N = 35$  DEGREES OF FREEDOM = 33  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 77 DEG F AMB RH



AMB 3066 PROPELLANT (AMB 'C') TEAR ENERGY, TIME TO TEAR, 77 DEG F, LINED CTNS

Figure 9-22

$Y = ((+2.7736427E+02) + (+1.7791474E+00) \times X)$   
 $F = +5.4689429E+00$  SIGNIFICANCE OF  $F =$  SIGNIFICANT  $\sigma = +7.0599923E+01$   
 $R = +3.6761291E-01$  SIGNIFICANCE OF  $R =$  SIGNIFICANT  $S_e = +7.6078203E-01$   
 $t = +2.3385771E+00$  SIGNIFICANCE OF  $t =$  SIGNIFICANT  $S_e = +6.6587782E+01$   
 $N = 37$  DEGREES OF FREEDOM = 35  
 STORAGE CONDITIONS = AMB TEMP/AH TEST CONDITIONS = 120 DEG F AMB RH

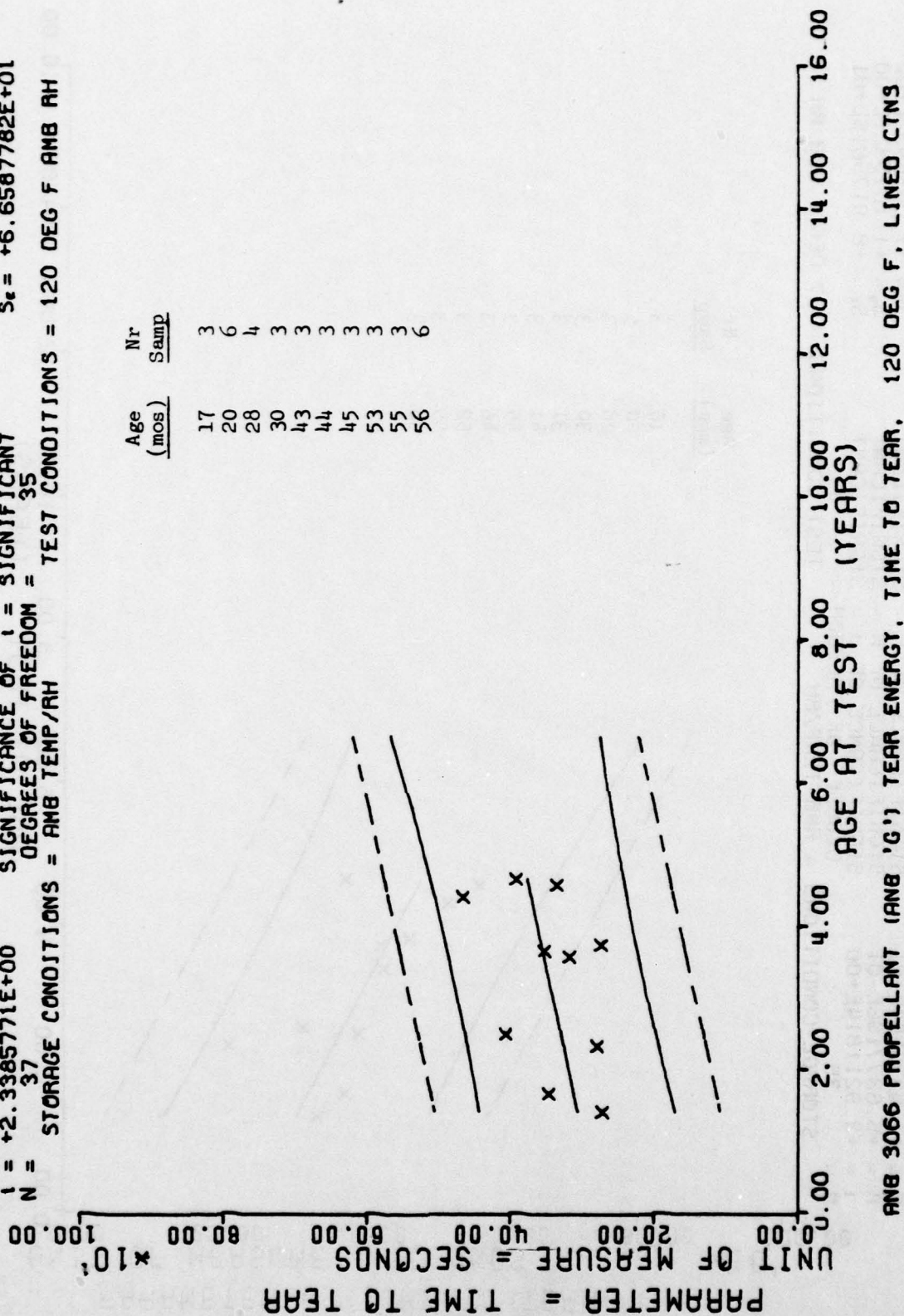


Figure 9-23

$Y = 1( +3.1103596E+02 ) + ( -2.0519217E-01 ) \times X$   
 $F = +2.5318710E-01$  SIGNIFICANCE OF F = NOT SIGNIFICANT  $G_r = +3.3816202E+01$   
 $R = -8.725778E-02$  SIGNIFICANCE OF R = NOT SIGNIFICANT  $S_a = +4.0779321E-01$   
 $I = +5.0317701E-01$  SIGNIFICANCE OF I = NOT SIGNIFICANT  $S_e = +3.4193822E+01$   
 $N = 35$  DEGREES OF FREEDOM = 33  
 STORAGE CONDITIONS = AMB TEMP/AH TEST CONDITIONS = 160 DEG F AMB RH

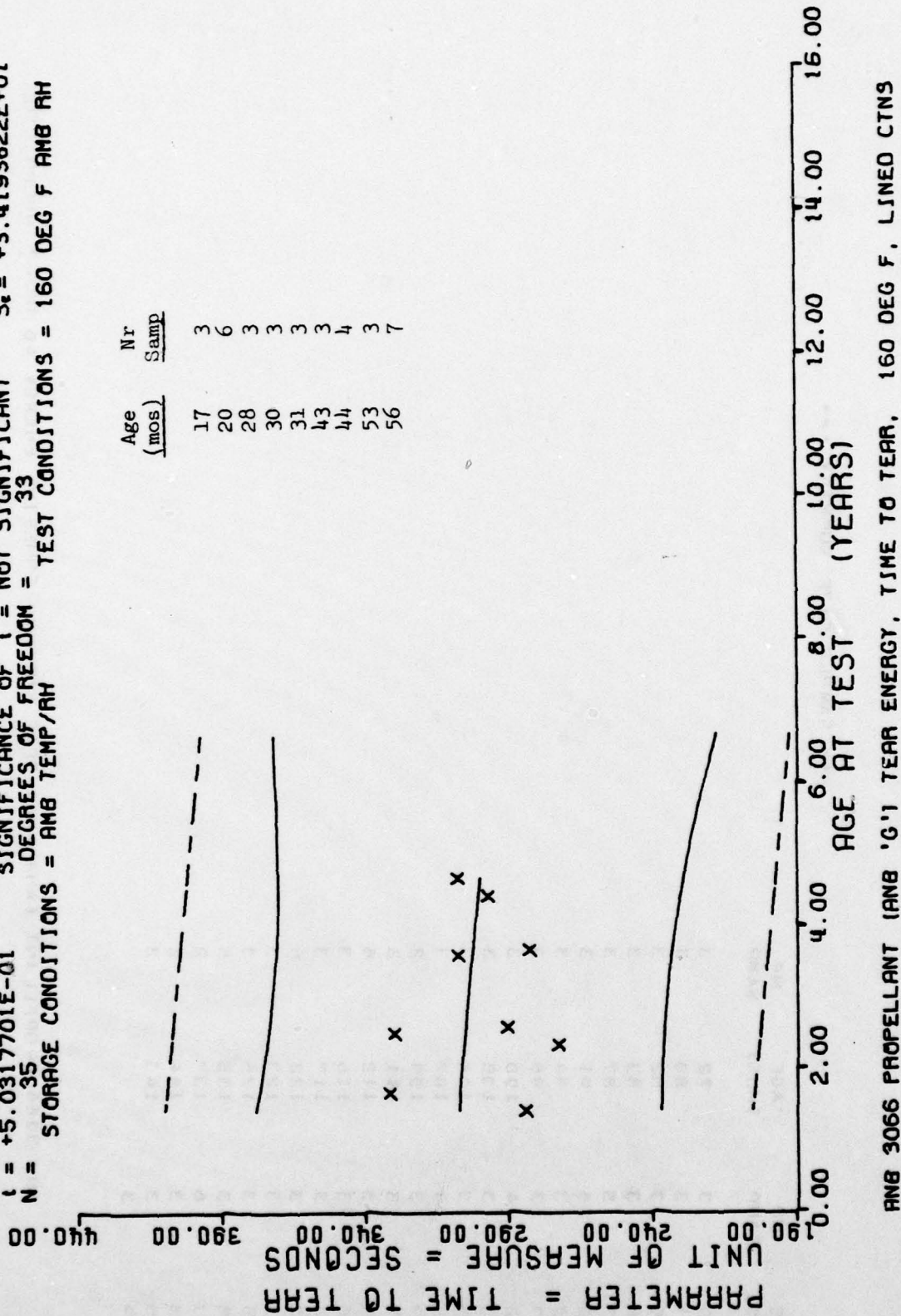


Figure 9-24

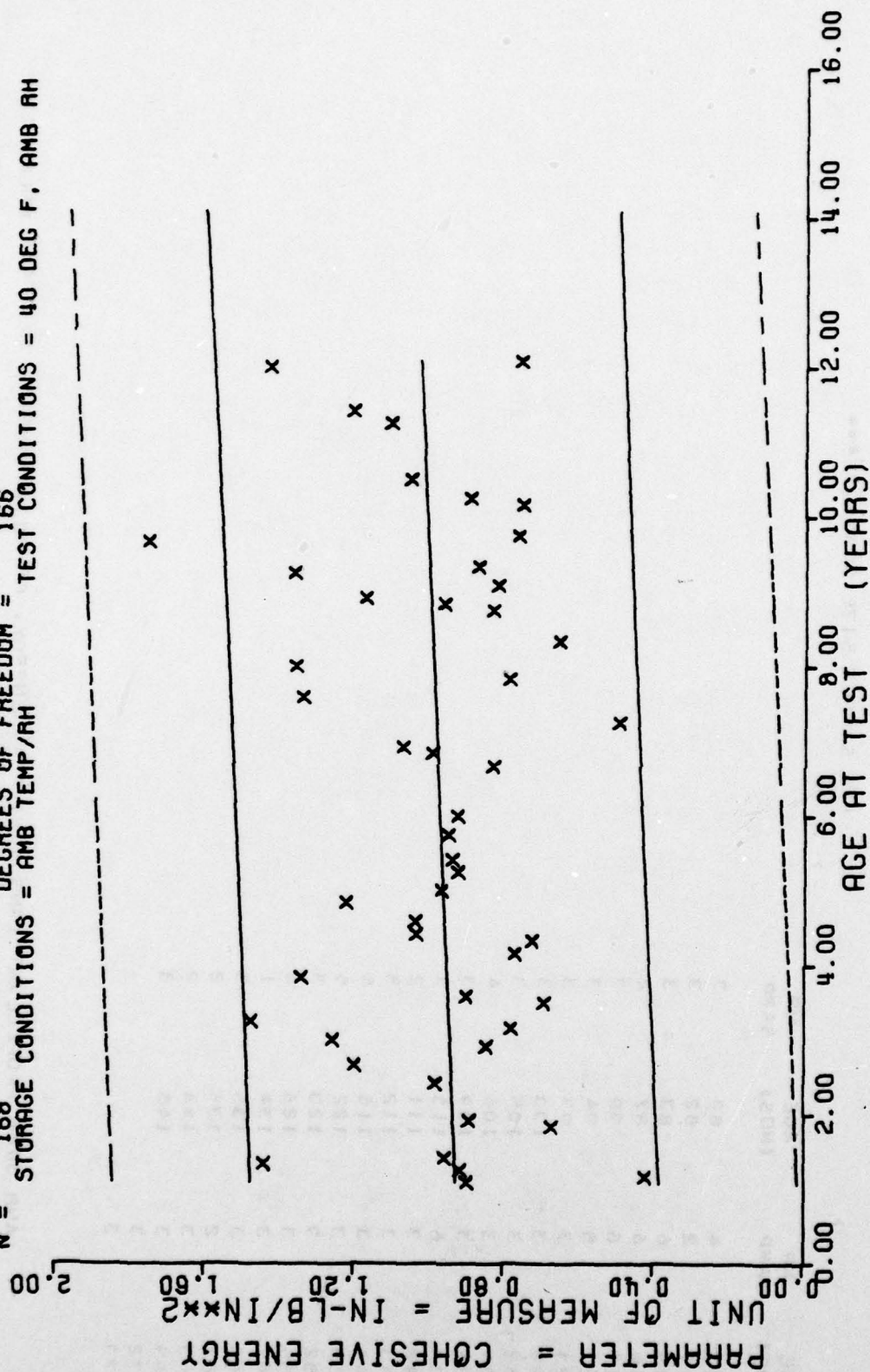


\*\*\* SAMPLE SIZE SUMMARY \*\*\*

AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP
13	3	72	3
14	3	80	3
15	3	82	3
16	3	83	3
17	5	87	3
22	6	91	3
23	3	94	3
29	3	96	3
32	4	100	3
35	3	105	3
36	3	106	3
38	3	107	3
39	3	109	2
42	3	111	3
43	3	112	6
46	3	116	3
50	3	117	3
52	3	122	6
53	3	123	3
55	3	126	3
58	3	135	6
60	6	137	2
63	3	144	2
65	3	145	3
69	3		

ANR 3066 PROPELLANT (ANR 1P1) TRAP ENERGY, COHESIVE ENERGY 40 DEG F UNILND CTNS

$Y = ((+9.2010785E-01) + (+7.5771271E-04) \times X)$   
 $F = +1.6847356E+00$  SIGNIFICANCE OF F = NOT SIGNIFICANT  $G_r = +3.0626886E-01$   
 $R = +1.0023493E-01$  SIGNIFICANCE OF R = NOT SIGNIFICANT  $S_p = +5.8376586E-04$   
 $t = +1.2979736E+00$  SIGNIFICANCE OF t = NOT SIGNIFICANT  $S_r = +3.0564290E-01$   
 $N = 168$  DEGREES OF FREEDOM = 166  
 STORAGE CONDITIONS = AMB TEMP/AH TEST CONDITIONS = 40 DEG F, AMB RH



ANB 3066 PROPELLANT (ANB 'P') TEAR ENERGY, COHESIVE ENERGY 40 DEG F UNLND CTNS

Figure 9-25

\*\*\* SAMPLE SIZE SUMMARY \*\*\*

AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP
13	4	80	3
14	2	82	3
15	6	83	3
16	6	87	2
17	6	90	3
22	5	94	3
23	3	95	3
29	3	100	3
32	3	105	3
34	3	106	4
36	3	109	3
37	6	110	3
42	3	111	2
43	3	112	5
45	3	115	6
50	3	122	6
52	3	123	3
55	3	126	3
57	3	134	1
60	3	135	3
62	2	136	2
65	3	144	2
69	3	145	3
72	3		
73	3		



$Y = ((+6.6583226E-01) + (+1.7743858E-03) * X)$   
 $F = +1.0556644E+01$  SIGNIFICANCE OF F = SIGNIFICANT  $\alpha = +2.8889904E-01$   
 $R = +2.4592051E-01$  SIGNIFICANCE OF R = SIGNIFICANT  $S_e = +5.4611627E-04$   
 $t = +3.2490990E+00$  SIGNIFICANCE OF t = SIGNIFICANT  $S_t = +2.8067939E-01$   
 $N = 166$  DEGREES OF FREEDOM = 164  
 STORAGE CONDITIONS = AMB TEMP/AH TEST CONDITIONS = 77 DEG F, AMB RH

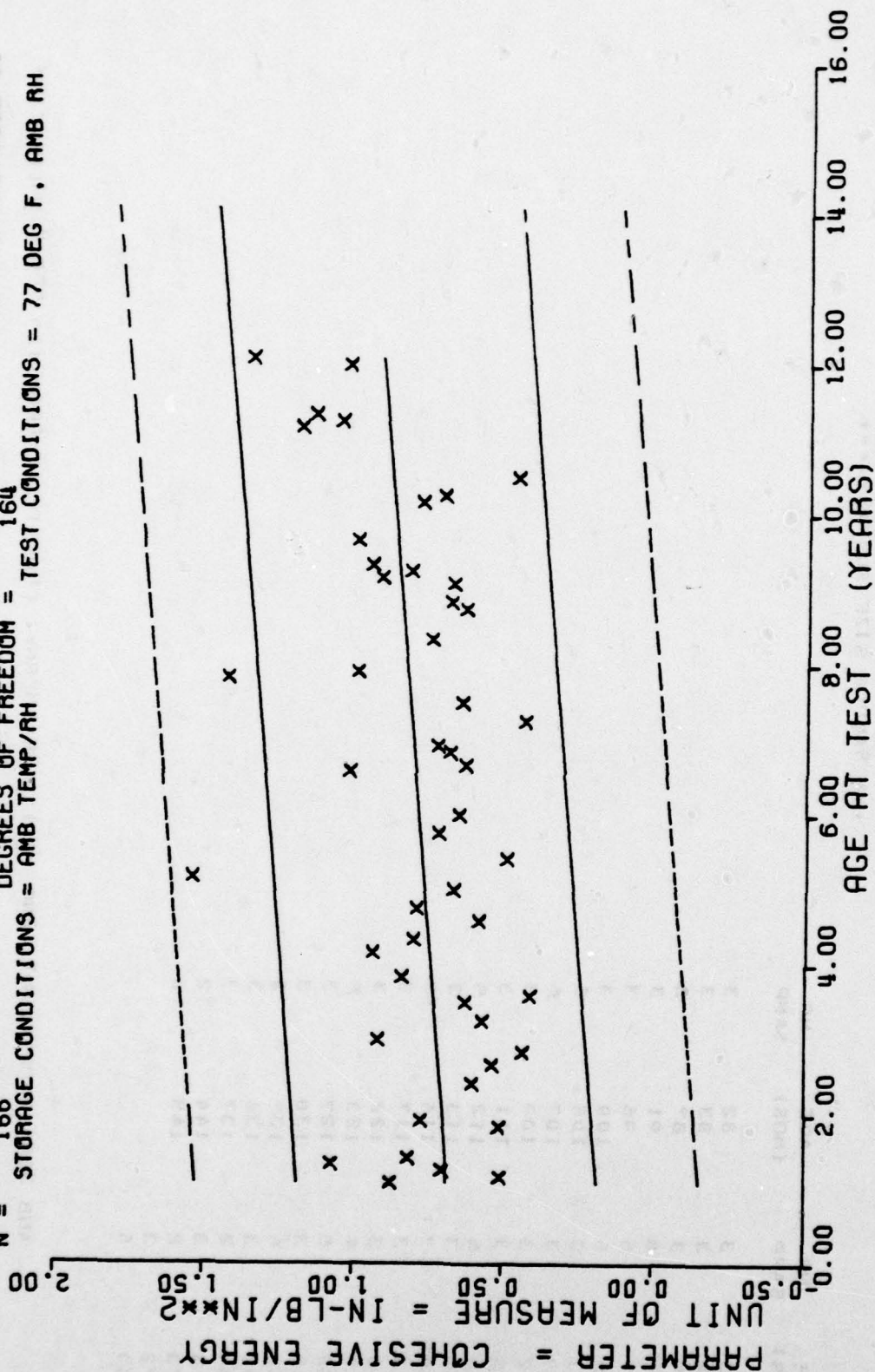


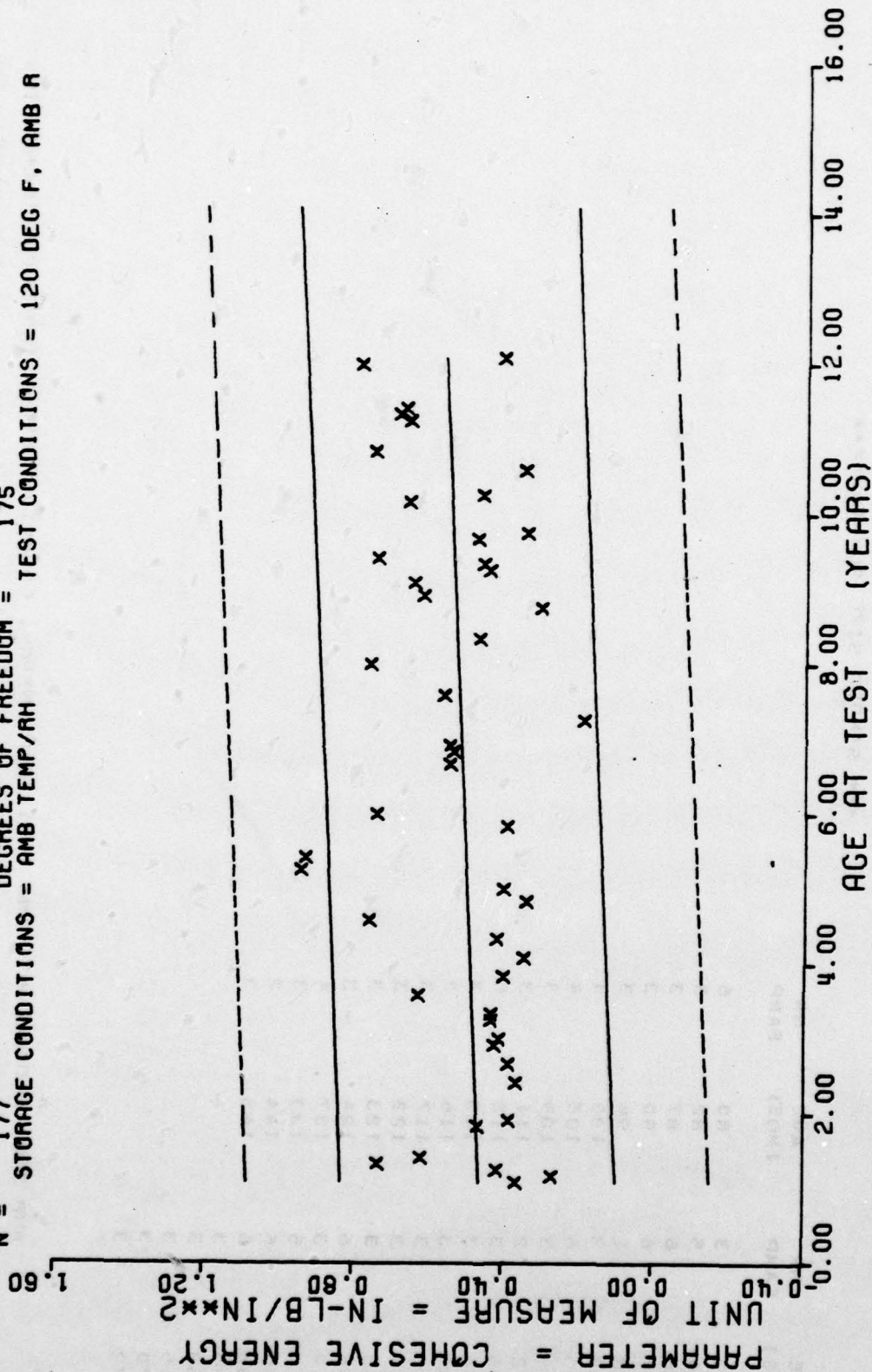
Figure 9-26

\*\*\* SAMPLE SIZE SUMMARY \*\*\*

AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP
13	3	82	3
14	3	83	3
15	3	87	3
16	6	91	3
17	6	96	3
22	6	100	3
23	3	105	6
29	3	107	6
32	3	109	3
35	3	111	3
36	6	112	5
39	3	113	3
40	7	116	3
43	3	117	3
45	3	122	3
49	4	123	6
52	5	127	3
55	3	130	3
59	6	135	3
60	3	136	3
63	2	137	3
65	3	144	2
70	2	145	3
72	3		
80	5		

AMB 3066 PROPELLANT (AMB 101) TEAR ENERGY, COHESIVE ENERGY 120 MFG F URIND CTIS

$Y = ((+4.5735377E-01) + (+7.4665194E-04) * X) * X$   
 $F = +3.8261421E+00$  SIGNIFICANCE OF F = NOT SIGNIFICANT  $G = +2.0832678E-01$   
 $R = +1.4627329E-01$  SIGNIFICANCE OF R = NOT SIGNIFICANT  $S_0 = +3.8171361E-04$   
 $t = +1.9560526E+00$  SIGNIFICANCE OF t = NOT SIGNIFICANT  $S_1 = +2.0667404E-01$   
 $N = 177$  DEGREES OF FREEDOM = 175  
 STORAGE CONDITIONS = AMB TEMP/AH TEST CONDITIONS = 120 DEG F, AMB R



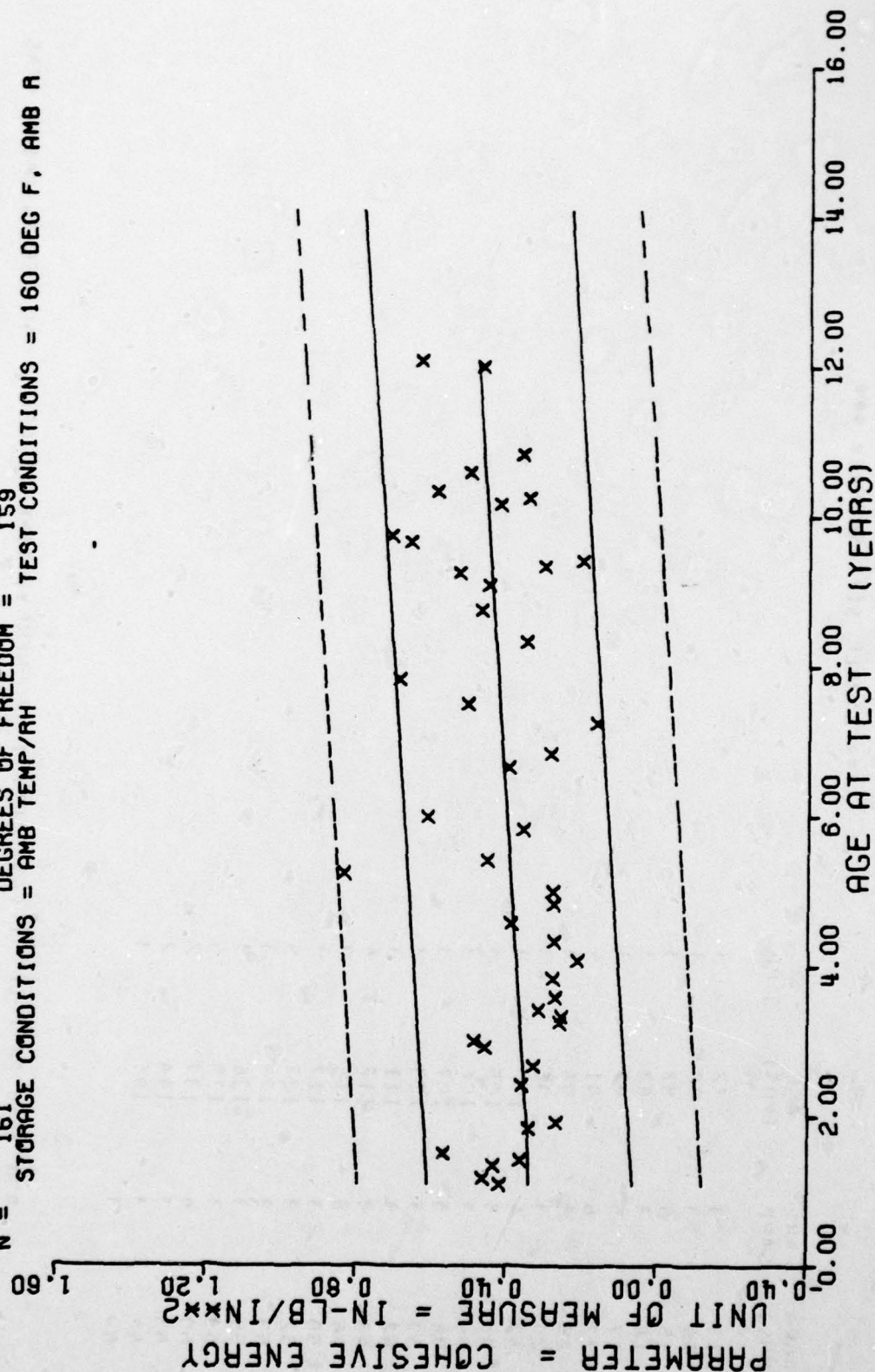


\*\*\* SAMPLE SIZE SUMMARY \*\*\*

AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP
13	3	80	6
14	5	82	3
16	6	87	3
17	6	90	3
18	1	94	3
22	3	100	3
23	6	105	4
29	3	109	3
32	2	111	3
35	3	112	6
36	3	113	3
39	3	116	3
40	3	117	3
41	3	122	3
43	3	123	3
46	6	124	3
49	3	127	4
52	5	130	3
55	6	144	2
58	6	145	3
60	3		
63	3		
65	3		
70	3		
72	3		

AIR 3045 PROPELLANT (ANH 101) TEAR ENERGY, COHESIVE ENERGY 160 DEG F UNLND CTNS

$Y = ((+3.2279561E-01) + (+1.1132376E-03) \times X)$   
 $F = +1.2899758E+01$  SIGNIFICANCE OF F = SIGNIFICANT  $\sigma = +1.5902505E-01$   
 $R = +2.7393855E-01$  SIGNIFICANCE OF R = SIGNIFICANT  $S_e = +3.0995389E-04$   
 $t = +3.5916239E+00$  SIGNIFICANCE OF t = SIGNIFICANT  $S_r = +1.5342209E-01$   
 $N = 161$  DEGREES OF FREEDOM = 159  
 STORAGE CONDITIONS = AMB TEMP/4H TEST CONDITIONS = 160 DEG F, AMB R



ANB 3066 PROPELLANT (AMB 'P') TEAR ENERGY, COHESIVE ENERGY 160 DEG F UNLND CTNS

Figure 9-28

\*\*\* SAMPLE SIZE SUMMARY \*\*\*

AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP
13	1	72	1
14	3	80	3
15	7	82	3
16	3	83	3
17	5	87	3
22	6	91	4
23	2	94	3
29	3	96	3
32	4	100	3
35	3	105	3
36	2	106	3
38	3	107	3
39	3	109	2
42	3	111	3
43	3	112	6
46	3	116	3
50	3	117	1
52	3	122	6
53	3	123	3
55	3	126	3
58	3	125	6
60	6	137	2
63	2	144	2
65	3	145	1
69	3		

AMR 4066 PROPELLANT (ANALYST) TEST ENERGY, TIME TO TEAR, 40 DEG F, UNLND CTNS



$Y = ((+4.4088953E+02) + (-2.8866712E-01) * X)$   
 $F = +3.5659633E+00$  SIGNIFICANCE OF F = NOT SIGNIFICANT  $G_1 = +8.0705104E+01$   
 $R = -1.4459133E-01$  SIGNIFICANCE OF R = NOT SIGNIFICANT  $S_2 = +1.5286529E-01$   
 $I = +1.8883758E+00$  SIGNIFICANCE OF I = NOT SIGNIFICANT  $S_4 = +8.0095747E+01$   
 $N = 169$  DEGREES OF FREEDOM = 167  
 STORAGE CONDITIONS :: AMB TEMP/RH TEST CONDITIONS :: 40 DEG F AMB RH

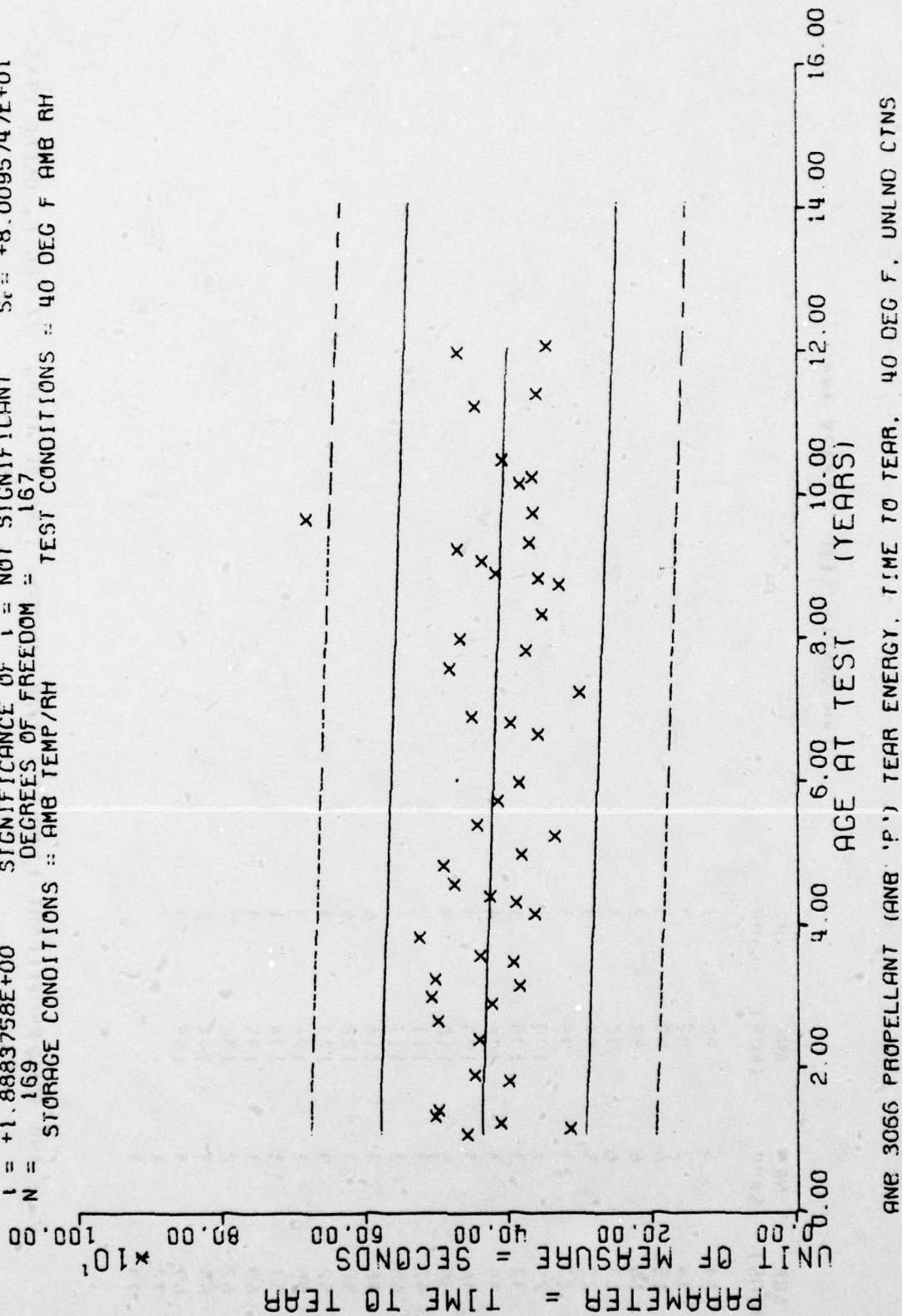


Figure 9-29

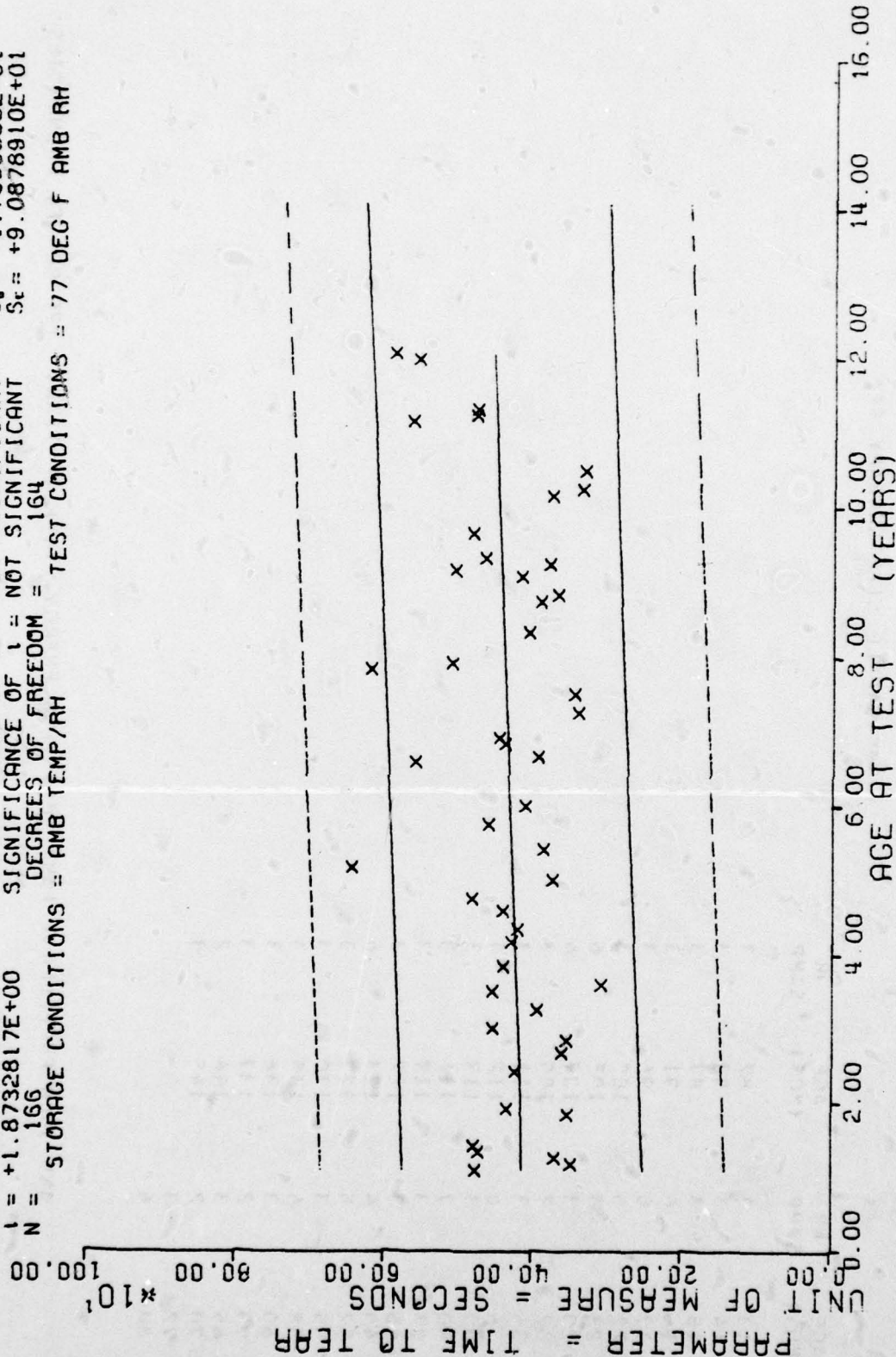
THIS PAGE IS BEST QUALITY REPRODUCTION  
FROM COPY FURNISHED TO DDC

\*\*\* SAMPLE SIZE SUMMARY \*\*\*

AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP
13	4	90	3
14	2	92	3
15	6	93	3
16	6	97	2
17	6	98	3
22	5	94	3
23	3	95	3
29	3	100	3
32	3	105	3
34	3	106	4
36	3	109	3
39	5	110	3
42	3	111	2
43	3	112	5
46	3	116	6
50	3	122	5
52	9	123	3
55	3	126	3
57	3	134	1
60	3	135	3
62	2	136	2
65	3	144	2
69	3	145	3
72	3		
77	3		

AMB 3066 PROPELLANT (AMB 90) TEAR ENERGY, TIME TO TEAR, 77 DEG F, UNLAD CTAS

Y = (( +4.0810353E+02 ) + ( +3.3100264E-01 ) \* X)  
 F = +3.5091846E+00 SIGNIFICANCE OF F = NOT SIGNIFICANT  $G_r = +9.1567309E+01$   
 R = +1.4473841E-01 SIGNIFICANCE OF R = NOT SIGNIFICANT  $S_a = +1.7669666E-01$   
 I = +1.8732817E+00 SIGNIFICANCE OF I = NOT SIGNIFICANT  $S_t = +9.0878910E+01$   
 N = 166 DEGREES OF FREEDOM = 164  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 77 DEG F AMB RH





\*\*\* SAMPLE SIZE SUMMARY \*\*\*

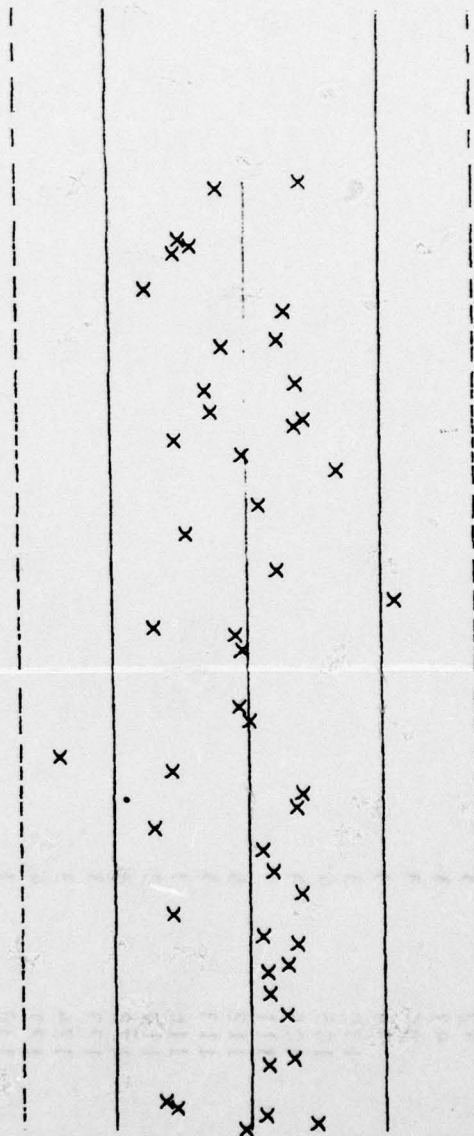
AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP
13	3	82	3
14	3	83	3
15	3	87	3
16	6	91	3
17	6	96	3
22	6	100	3
23	3	105	6
27	3	107	6
32	3	109	3
35	3	111	3
36	6	112	5
39	3	113	3
40	7	116	3
43	3	117	3
46	3	122	3
47	4	123	6
52	5	127	3
55	3	130	3
58	6	135	3
60	3	136	3
63	2	137	3
65	3	144	2
70	2	145	3
72	3		
80	6		

AND 3066 PROPELLANT (AND 900) TEAR ENERGY, TIME TO TEAR, 120 DEG F, UNLND CTMS

$Y = ((+3.9321581E+02) + (+1.3210677E-01) \times X)$   
 $F = +6.5496186E-01$  SIGNIFICANCE OF F = NOT SIGNIFICANT  $G = +8.8295642E+01$   
 $R = +6.1062952E-02$  SIGNIFICANCE OF R = NOT SIGNIFICANT  $S_0 = +1.6323643E-01$   
 $I = +8.0929714E-01$  SIGNIFICANCE OF I = NOT SIGNIFICANT  $S_e = +8.8382319E+01$   
 $N = 177$  DEGREES OF FREEDOM = 175  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 120 DEG F AMB RH

UNIT OF MEASURE = SECONDS  
 $\times 10^1$

PARAMETER = TIME TO TEAR



AGE AT TEST (YEARS)  
 0.00 2.00 4.00 6.00 8.00 10.00 12.00 14.00 16.00

AMB 3066 PROPELLANT (AMB 'P') TEAR ENERGY, TIME TO TEAR, 120 DEG F, UNLND CTNS

Figure 9-31

\*\*\* SAMPLE SIZE SUMMARY \*\*\*

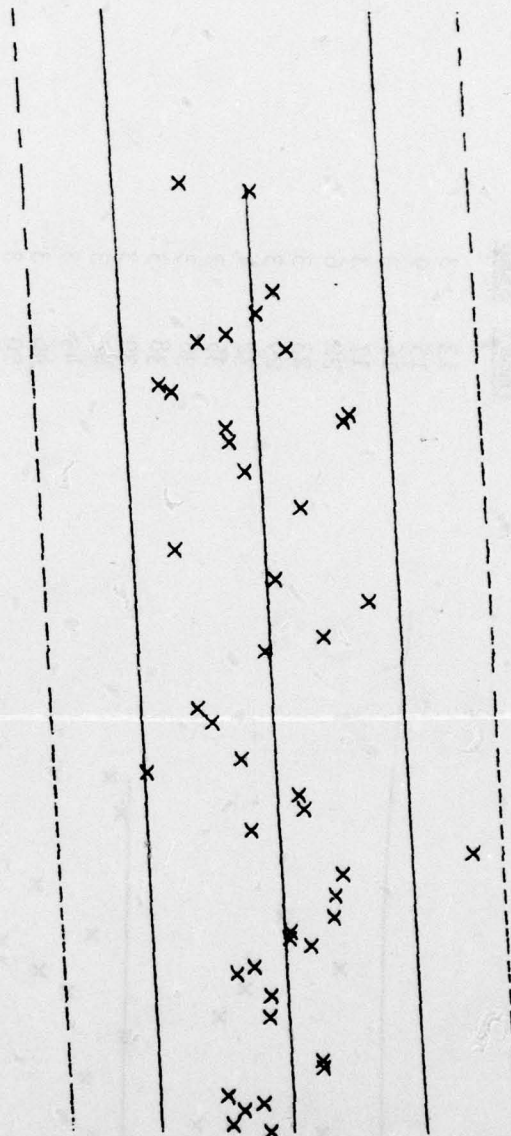
AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP
13	3	80	6
14	5	82	3
16	6	97	3
17	6	98	3
18	1	94	3
22	3	100	3
23	6	105	4
29	3	109	3
32	2	111	3
35	3	112	6
36	3	113	3
39	3	116	3
40	3	117	3
41	3	122	3
43	3	123	3
46	6	124	3
49	3	127	4
52	5	130	3
55	6	144	2
58	6	145	3
60	3		
63	3		
65	3		
70	3		
72	3		

AMB 3066 PROPELLANT (AMB 'P') YEAR ENERGY, TIME TO TEAR, 160 DEG F, UNLND CINS



$Y = ( (+3.1905010E+02) + (+5.0368014E-01) \times X )$   
 $F = +8.3610323E+00$  SIGNIFICANCE OF F = SIGNIFICANT  $G_r = +8.8182593E+01$   
 $R = +2.2351299E-01$  SIGNIFICANCE OF R = SIGNIFICANT  $S_r = +1.7419066E-01$   
 $I = +2.8915449E+00$  SIGNIFICANCE OF I = SIGNIFICANT  $S_r = +8.6221522E+01$   
 $N = 161$  DEGREES OF FREEDOM = 159  
 STORAGE CONDITIONS = AMB TEMP/AM TEST CONDITIONS = 160 DEG F AMB RH

PARAMETER = TIME TO TEAR  
 UNIT OF MEASURE = SECONDS  
 $\times 10^1$

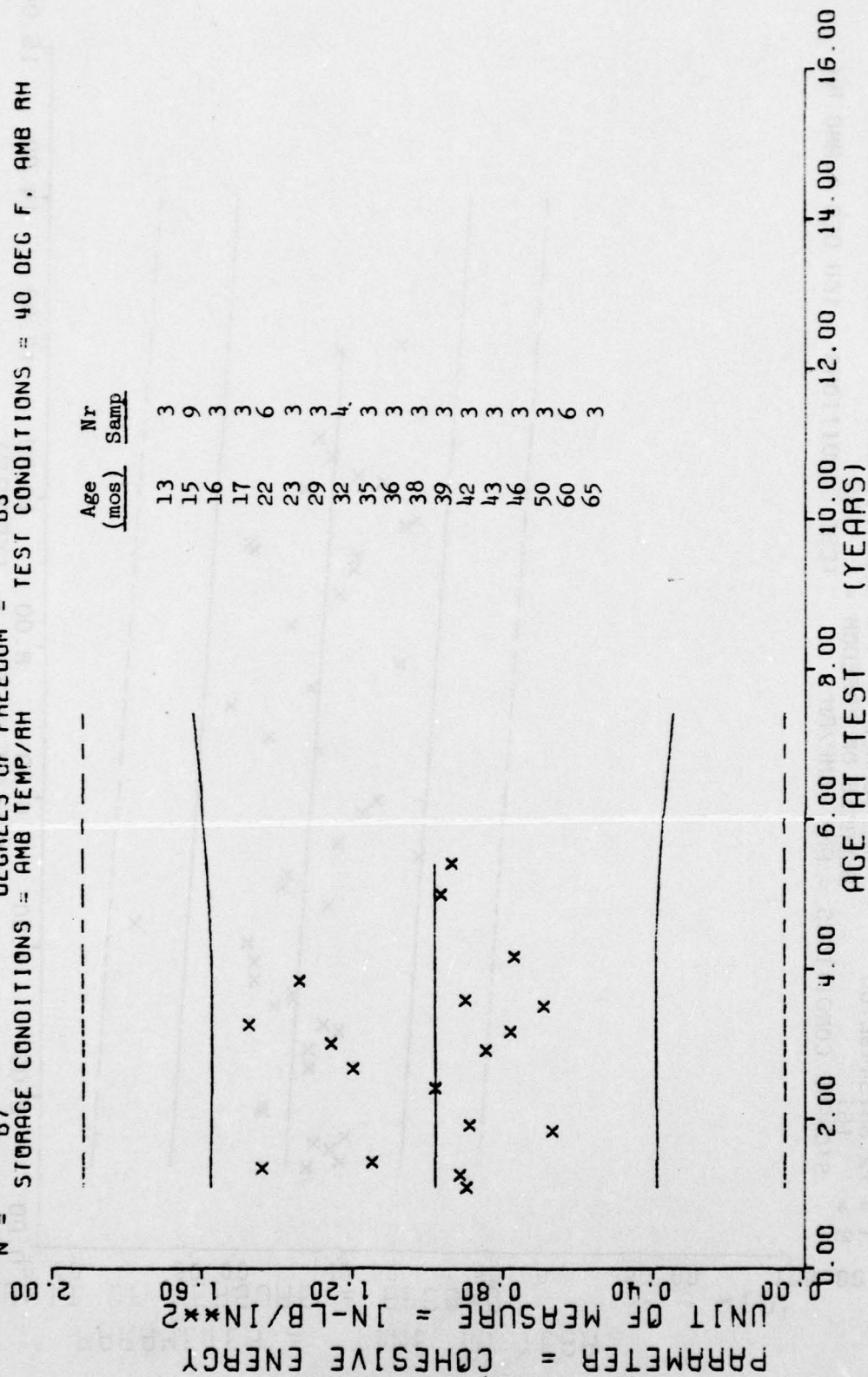


AGE AT TEST (YEARS)

AMB 3066 PROPELLANT (AMB 'P') TEAR ENERGY, TIME TO TEAR, 160 DEG F, UNLND CTNS

Figure 9-32

$Y = ((+9.8455960E-01) + (+2.6672597E-05) \times X)$   
 $F = +1.2018979E-04$  SIGNIFICANCE OF F = NOT SIGNIFICANT  $G_1 = +3.0927501E-01$   
 $R = +1.3598052E-03$  SIGNIFICANCE OF R = NOT SIGNIFICANT  $S_1 = +2.4329406E-03$   
 $t = +1.0963110E-02$  SIGNIFICANCE OF t = NOT SIGNIFICANT  $S_2 = +3.1164469E-01$   
 $N = 67$  DEGREES OF FREEDOM = 65  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 40 DEG F, AMB RH



ANB 3066 PROPELLANT (ANB 'P') TEAR ENERGY, COHESIVE ENERGY 40 DEG F LINED CTNS

Figure 9-33

$Y = ((+8.0113284E-01) + (-2.4788399E-03) \times X)$   
 $F = +1.5431924E+00$  SIGNIFICANCE OF F = NOT SIGNIFICANT  $G_1 = +2.6017949E-01$   
 $R = -1.4790487E-01$  SIGNIFICANCE OF R = NOT SIGNIFICANT  $S_A = +1.9954389E-03$   
 $t = +1.2422529E+00$  SIGNIFICANCE OF t = NOT SIGNIFICANT  $S_t = +2.5917584E-01$   
 $N = 71$  DEGREES OF FREEDOM = 69  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 77 DEG F. AMB RH

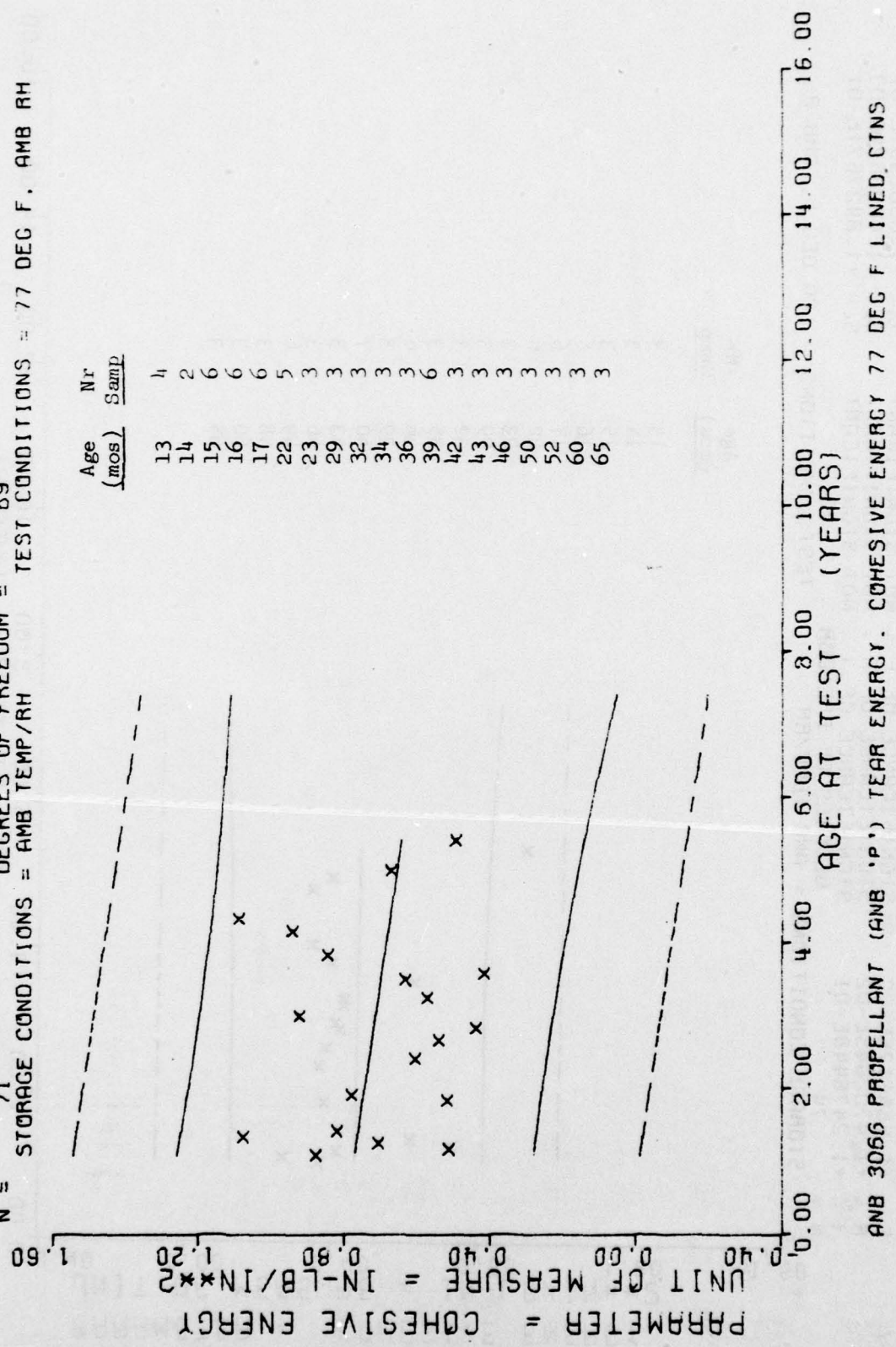
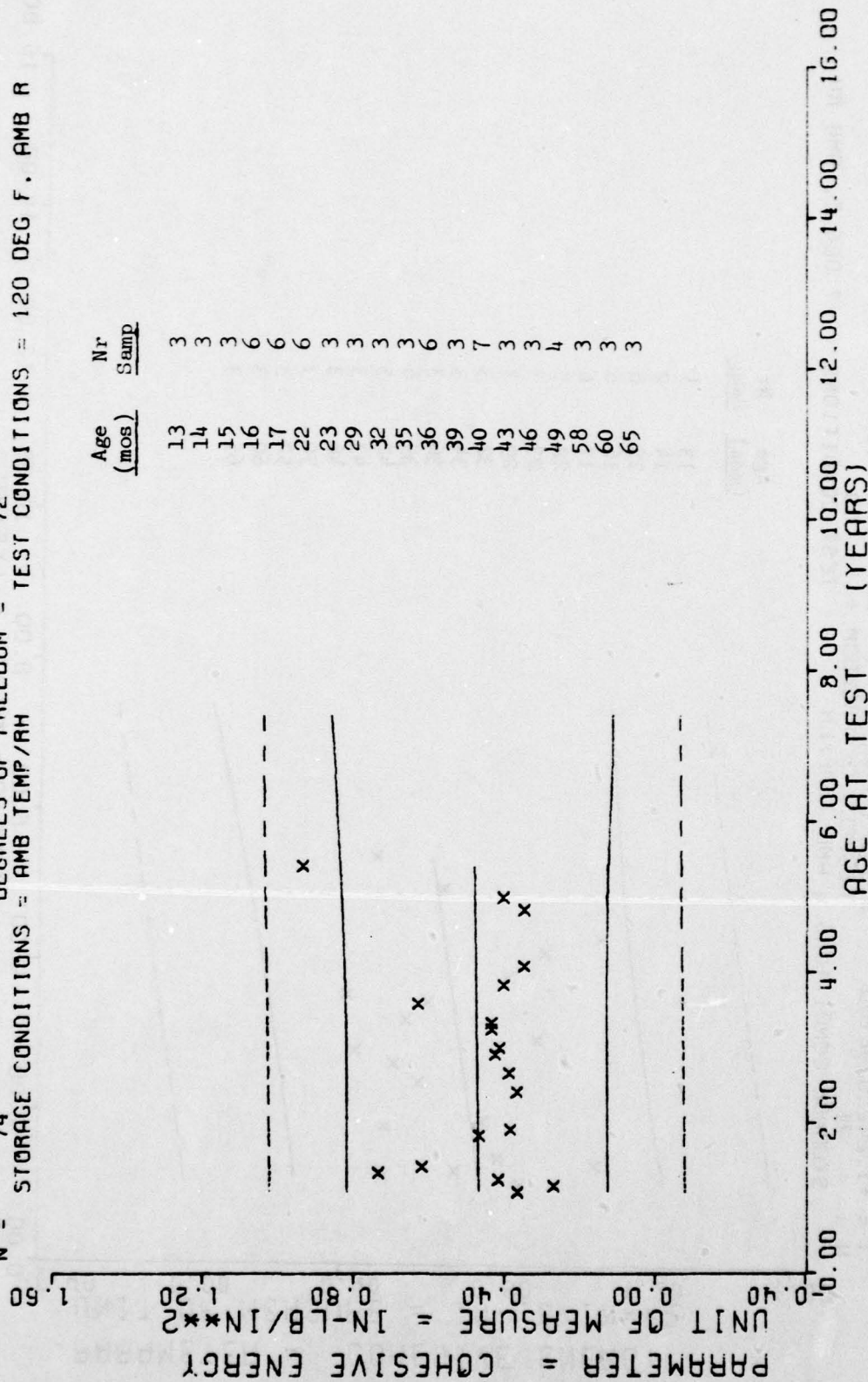


Figure 9-34



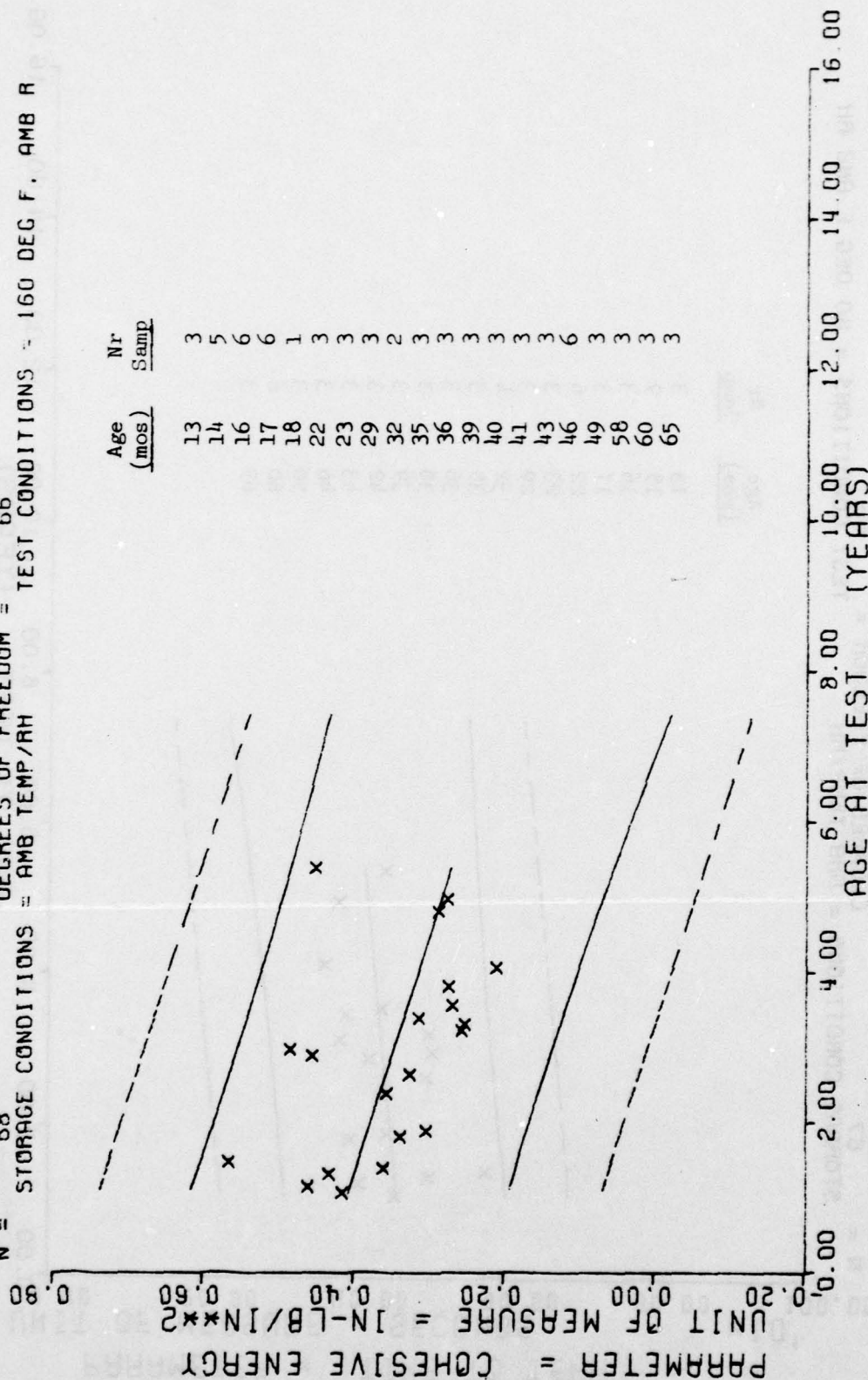
$Y = ((+4.6984530E-01) + (+1.7590143E-04) \times X)$   
 $F = +1.5566175E-02$  SIGNIFICANCE OF F = NOT SIGNIFICANT  $G_1 = +1.8302997E-01$   
 $R = +1.4702045E-02$  SIGNIFICANCE OF R = NOT SIGNIFICANT  $S_1 = +1.4098679E-03$   
 $t = +1.2476448E-01$  SIGNIFICANCE OF t = NOT SIGNIFICANT  $S_2 = +1.8427671E-01$   
 $N = 74$  DEGREES OF FREEDOM = 72  
 STORAGE CONDITIONS = AMB TEMP/AM TEST CONDITIONS = 120 DEG F. AMB R



ANB 3066 PROPELLANT (ANB 'P') TEAR ENERGY, COHESIVE ENERGY 120 DEG F LINED CTNS

Figure 9-35

$Y = ((+4.4261326E-01) + (-2.6321408E-03) \times X)$   
 $F = +9.4561757E+00$  SIGNIFICANCE OF F = SIGNIFICANT  
 $R = -3.5400579E-01$  SIGNIFICANCE OF R = SIGNIFICANT  
 $t = +3.0750895E+00$  SIGNIFICANCE OF t = SIGNIFICANT  
 $N = 68$  DEGREES OF FREEDOM = 66  
 STORAGE CONDITIONS = AMB TEMP/AH TEST CONDITIONS = 160 DEG F, AMB R



ANB 3066 PROPELLANT (ANB 'P') TEAR ENERGY, COHESIVE ENERGY 160 DEG F LINED CTNS

Figure 9-36

$Y = (1 + 4.7085042E+02) + (-8.6347302E-01) \times X$   
 $F = +2.0762977E+00$  SIGNIFICANCE OF F = NOT SIGNIFICANT  $G = +7.7382855E+01$   
 $R = -1.7593825E-01$  SIGNIFICANCE OF R = NOT SIGNIFICANT  $S_0 = +5.9924436E-01$   
 $I = +1.4409364E+00$  SIGNIFICANCE OF I = NOT SIGNIFICANT  $S_t = +7.6759507E+01$   
 $N = 67$  DEGREES OF FREEDOM = 65  
 STORAGE CONDITIONS = AMB TEMP/AM TEST CONDITIONS = 40 DEG F AMB RH

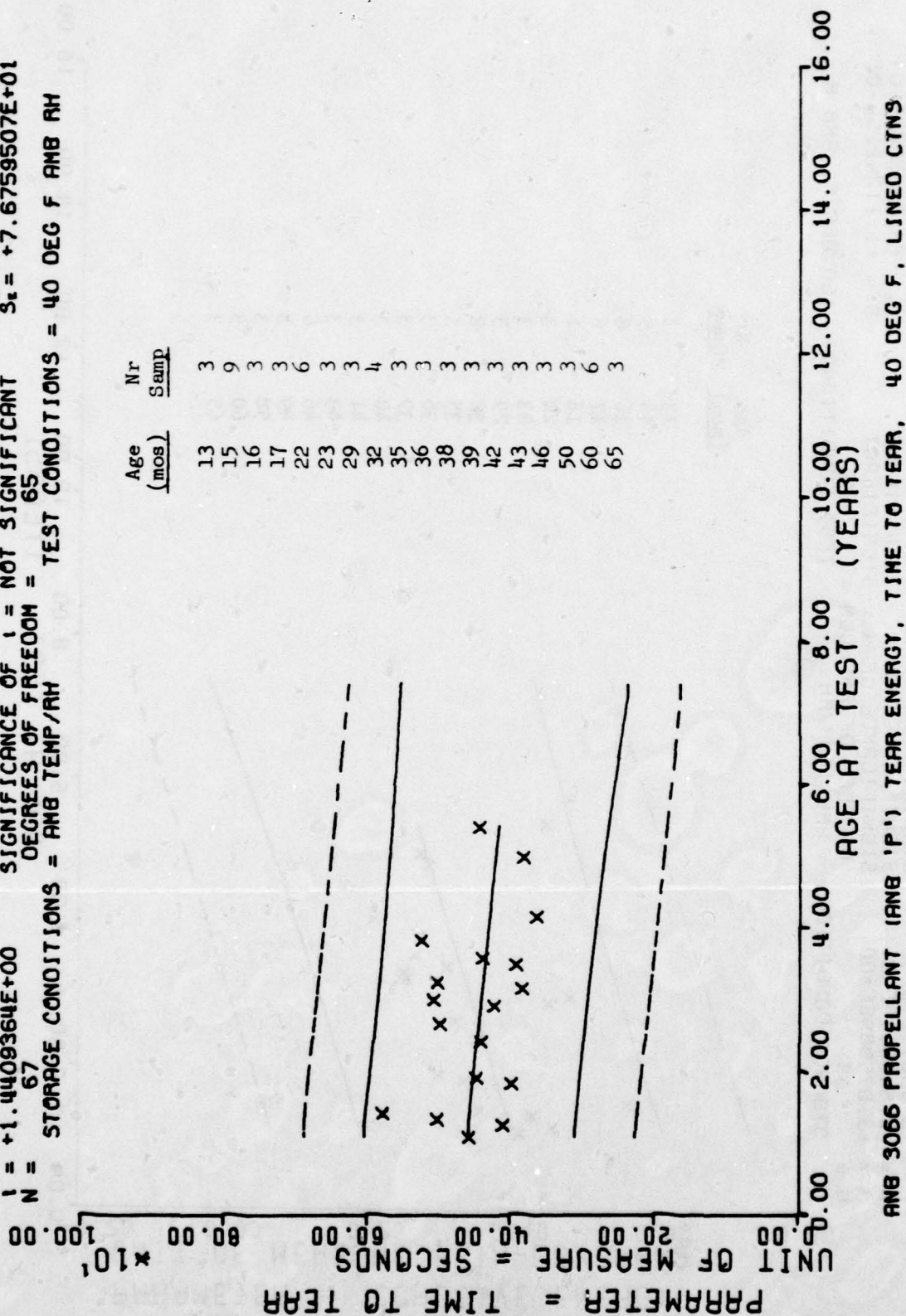
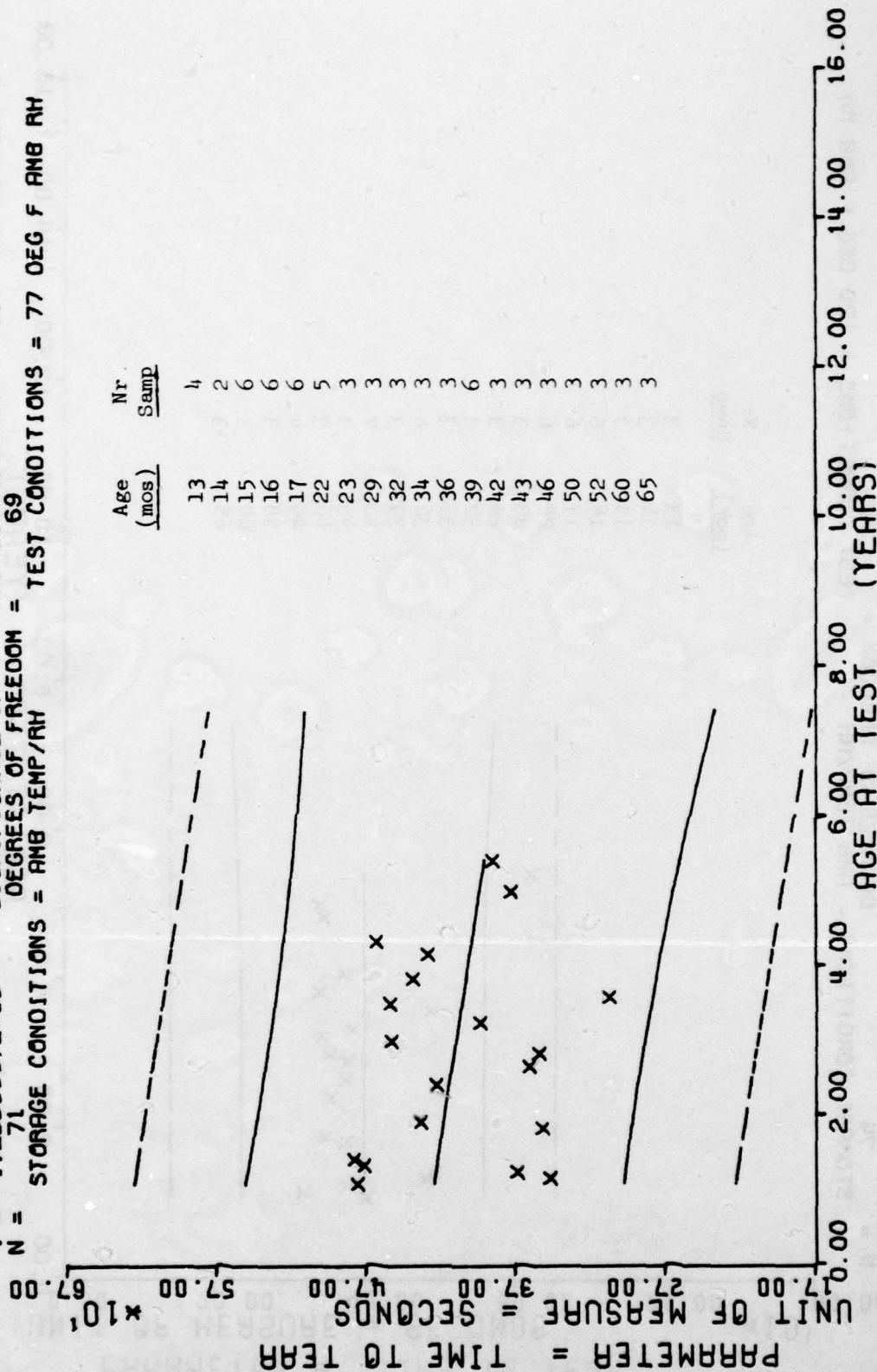


Figure 9-37



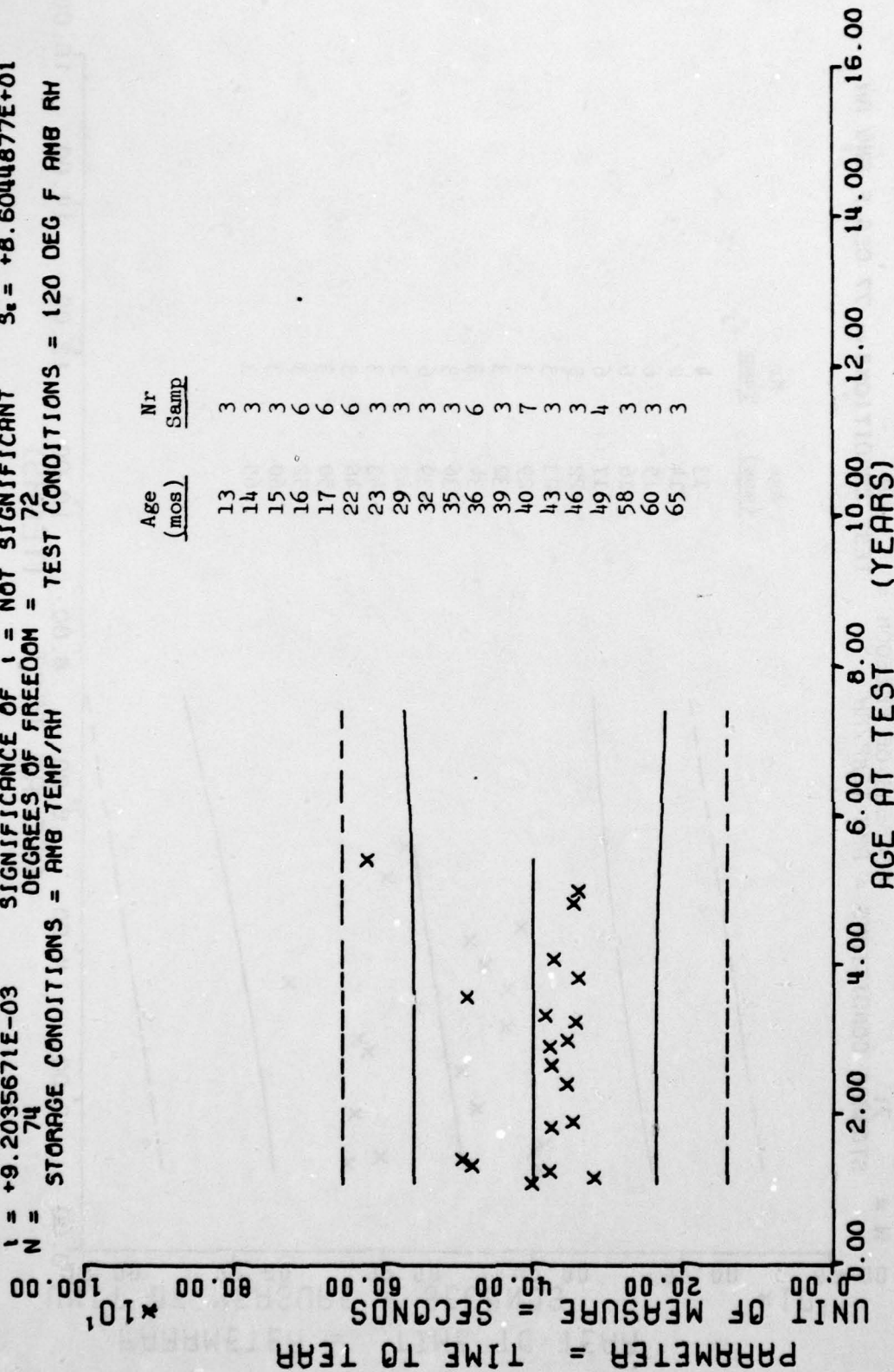
$F = +1.6603631E+00$   
 $R = -1.5328992E-01$   
 $I = +1.2885507E+00$   
 $N = 71$   
 $Y = ((+4.3327401E+02) + (-6.6662157E-01) * X)$   
 SIGNIFICANCE OF F = NOT SIGNIFICANT  
 SIGNIFICANCE OF R = NOT SIGNIFICANT  
 SIGNIFICANCE OF I = NOT SIGNIFICANT  
 DEGREES OF FREEDOM = 69  
 STORAGE CONDITIONS = AMB TEMP/AH  
 TEST CONDITIONS = 77 DEG F AMB RH



ANB 3066 PROPELLANT (ANB 'P') TEAR ENERGY, TIME TO TEAR, 77 DEG F, LINED CTNS

Figure 9-38

$Y = (1 + 3.9800015E+02) + (-6.0588356E-03) \times X$   
 $F = +8.4705647E-05$  SIGNIFICANCE OF F = NOT SIGNIFICANT  $G_1 = +8.545354/E+01$   
 $R = -1.0846501E-03$  SIGNIFICANCE OF R = NOT SIGNIFICANT  $S_1 = +6.5891384E-01$   
 $I = +9.2035671E-03$  SIGNIFICANCE OF I = NOT SIGNIFICANT  $S_2 = +8.6044877E+01$   
 $N = 74$  DEGREES OF FREEDOM = 72  
 STORAGE CONDITIONS = AMB TEMP/AM TEST CONDITIONS = 120 DEG F AMB RH



ANB 3066 PROPELLANT (ANB 'P') TEAR ENERGY, TIME TO TEAR, 120 DEG F, LINED CTNS

Figure 9-39

$\gamma = ((+3.7630746E+02) + (-9.8536435E-01) \times X)$   
 $F = +4.0537856E+00$  SIGNIFICANCE OF F = N.C. SIGNIFICANT  $G = +6.5037416E+01$   
 $R = -2.4055510E-01$  SIGNIFICANCE OF R = SIGNIFICANT  $S_0 = +4.8940281E-01$   
 $t = +2.0134015E+00$  SIGNIFICANCE OF t = SIGNIFICANT  $S_1 = +6.3604065E+01$   
 $N = 68$  DEGREES OF FREEDOM = 66  
 STORAGE CONDITIONS = AMB TEMP/AM TEST CONDITIONS = 160 DEG F AMB RH

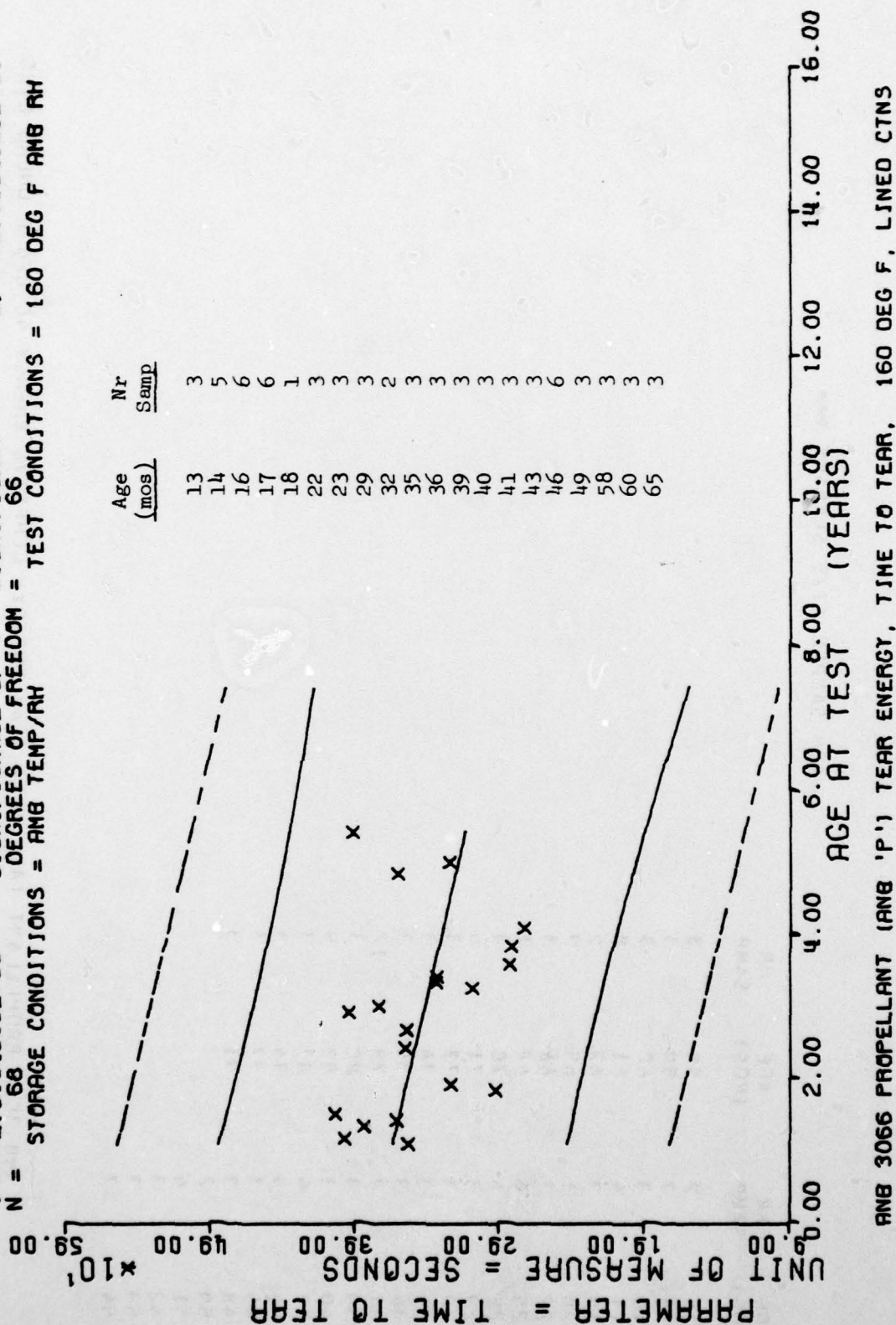


Figure 9-40



THIS PAGE IS BEST QUALITY PRACTICALLY  
FROM COPY FURNISHED TO DDC

9 - 59

\*\*\* SAMPLE SIZE SUMMARY \*\*\*

AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP
14	2	58	3
15	7	59	3
16	3	60	3
17	4	61	3
19	3	62	5
20	5	65	9
22	3	66	3
25	6	68	1
28	6	70	3
29	3	71	6
30	3	73	3
31	3	74	3
36	3	75	3
37	3	78	12
39	3	90	3
40	3	92	9
42	6	83	3
44	9	84	3
46	3	87	3
48	3	91	3
50	2		
51	6		
52	3		
53	3		
54	7		

ANB 3066 PROPELLANT (ANT 000) TEAR ENERGY, COHESIVE ENERGY 40 DEG F UNLND CTAS

$F = +2.1331722E+00$   
 $R = +1.0402389E-01$   
 $t = +1.4605383E+00$   
 $N = 197$   
 $Y = ((+9.0069884E-01) + (+1.4733884E-03) * X)$   
 SIGNIFICANCE OF F = NOT SIGNIFICANT  
 SIGNIFICANCE OF R = NOT SIGNIFICANT  
 SIGNIFICANCE OF t = NOT SIGNIFICANT  
 DEGREES OF FREEDOM = 195  
 STORAGE CONDITIONS = AMB TEMP/AH  
 TEST CONDITIONS = 40 DEG F, AMB RH

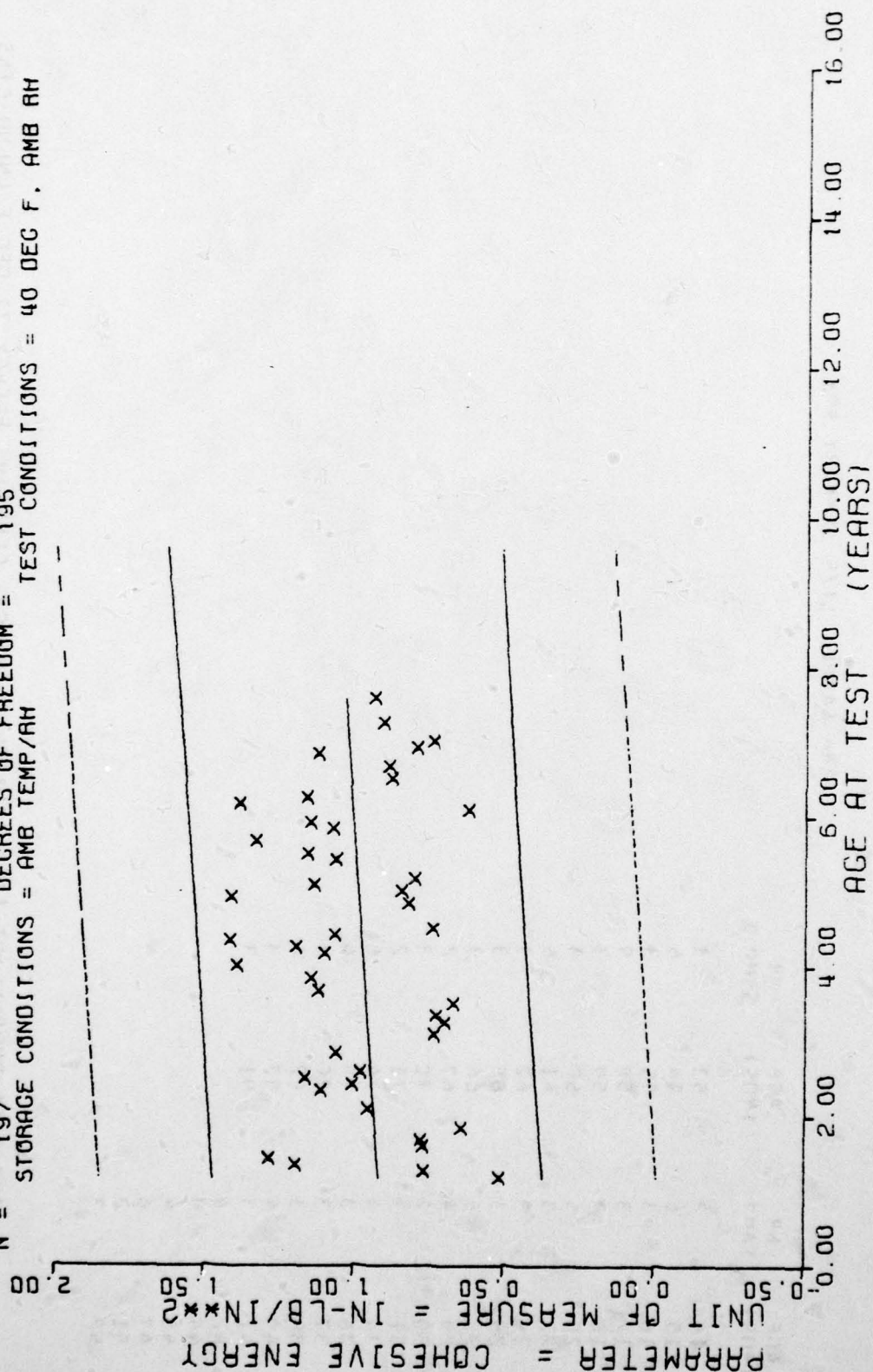


Figure 9-41

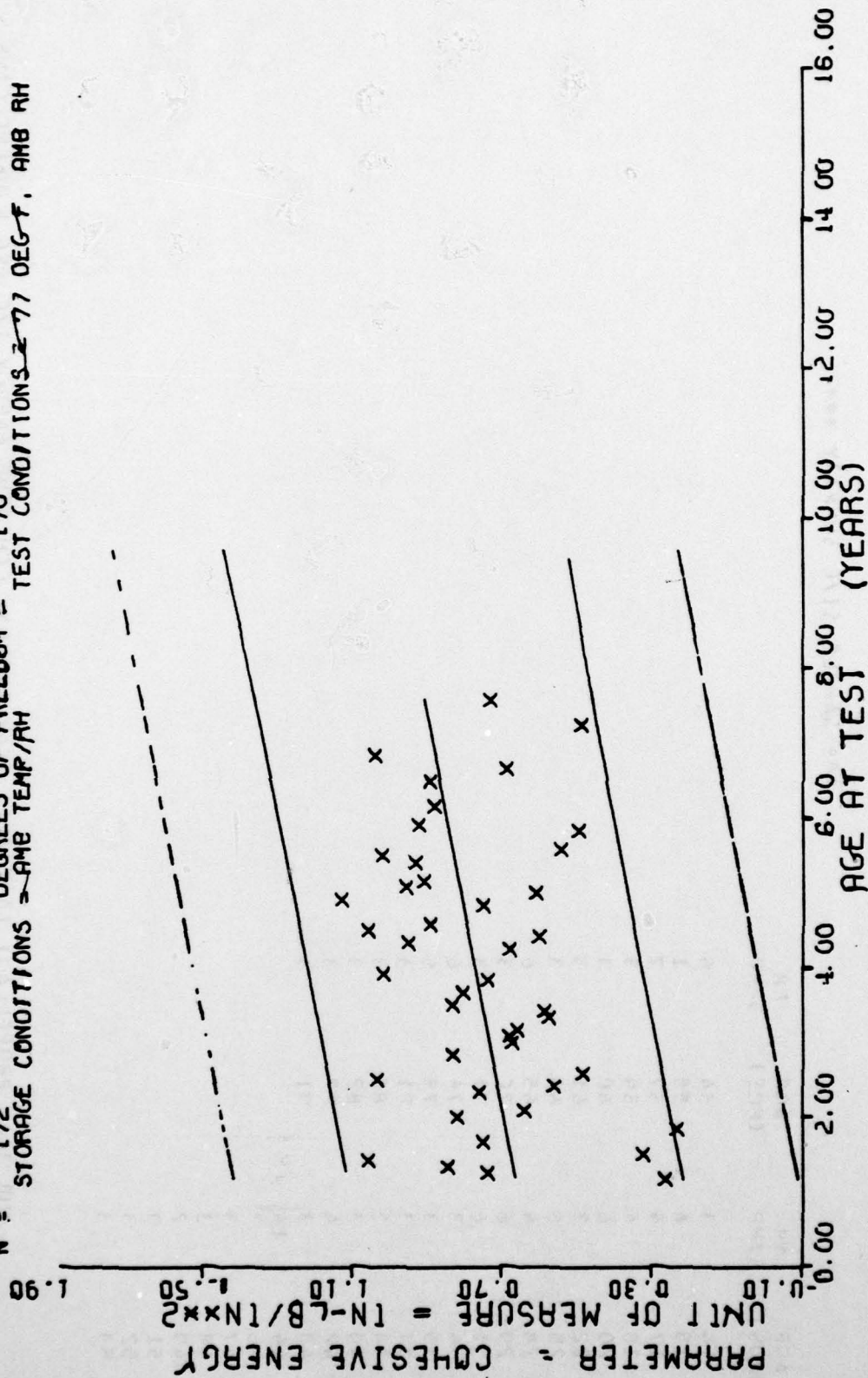
\*\*\* SAMPLE SIZE SUMMARY \*\*\*

AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP
14	3	53	3
15	6	54	6
16	3	55	3
17	3	58	9
18	3	59	3
20	5	59	3
22	3	61	6
24	3	62	3
25	3	65	3
28	6	66	3
29	4	67	2
30	2	70	3
31	3	71	2
34	3	74	6
36	3	78	6
37	3	80	3
38	3	82	6
40	4	87	3
41	3	91	3
42	4		
44	0		
46	4		
47	6		
51	3		
52	3		

ANR 3066 PROPULSANT (ANT 00) TEAR ENERGY, COHESIVE ENERGY 77 DEG F UNLND CTAS



$Y = (( +0.2193415E-01 ) + ( +3.1391033E-03 ) \times X)$   
 $F = +1.166078E+01$  SIGNIFICANCE OF F = SIGNIFICANT  $G = +2.5933114E-01$   
 $R = +2.5335722E-01$  SIGNIFICANCE OF R = SIGNIFICANT  $S_e = +9.1926711E-04$   
 $t = +3.4147691E+00$  SIGNIFICANCE OF t = SIGNIFICANT  $S_e = +2.5160600E-01$   
 $N = 172$  DEGREES OF FREEDOM = 170  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 77 DEG F, AMB RH



AMB 3066 PROPELLANT (ANT 'P', TEAR ENERGY, COHESIVE ENERGY 77 DEG F UNLMD CTNS

Figure 9-42

\*\*\* SAMPLE SIZE SUMMARY \*\*\*

AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP
14	3	54	6
15	6	55	1
17	4	57	7
18	4	59	3
20	6	60	3
22	2	61	3
25	6	64	3
28	4	65	6
29	6	70	3
31	6	71	3
34	2	74	6
35	3	79	5
37	3	81	3
38	2	82	3
40	3	83	3
42	4	87	3
43	3	91	3
44	14		
46	3		
47	3		
48	3		
49	2		
51	7		
52	3		
53	3		

ANB 3066 PROPELLANT (ANT 'P') IFAR ENERGY, COMPSIVE FAERGY 120 DEC F UNLNC CINS

Y = (14-9251571E-01) (3-9865283E-04) \* X)  
 F = +3.8405006E-01 SIGNIFICANCE OF F = NOT SIGNIFICANT  $\sigma_f = +1.7278972E-01$   
 R = +4.7064058E-02 SIGNIFICANCE OF R = NOT SIGNIFICANT  $S_e = +6.4053663E-04$   
 t = +6.197173E 01 SIGNIFICANCE OF t = NOT SIGNIFICANT  $S_e = +1.7309037E-01$   
 N = 175 DEGREES OF FREEDOM = 173  
 STORAGE CONDITIONS = AMB TEMP/AMB TEST CONDITIONS = 120 DEG F, AMB R

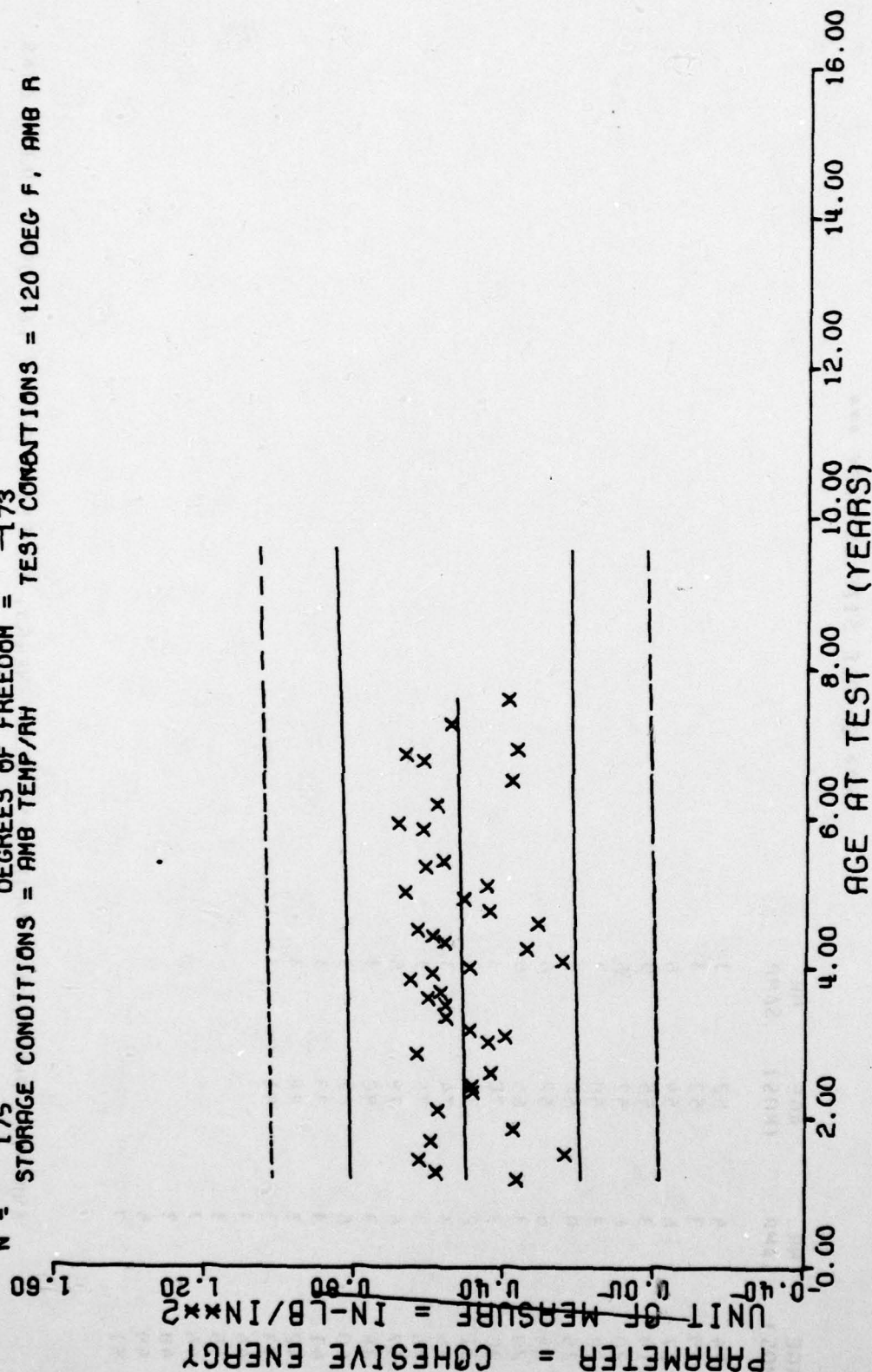


Figure 9-43



\*\*\* SAMPLE SIZE SUMMARY \*\*\*

AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP
14	4	52	3
15	3	53	3
17	6	54	6
19	3	55	9
20	6	57	6
22	3	59	3
25	9	60	3
28	6	62	6
29	3	65	6
30	3	70	3
31	2	71	3
34	3	74	3
36	3	75	3
37	6	78	5
38	3	80	3
40	6	82	3
41	3	83	3
42	3	88	3
43	3	91	3
44	3		
45	3		
46	7		
48	3		
49	5		
51	7		

NR 1066 PROPELLANT (AUT 'P') TEAR ENERGY, COHESIVE ENERGY 160 DEC F UNLND CTAS

Y = ( ( +2.7914050E-01 ) + ( +2.2833502E-03 ) \* X )  
 F = +1.7011908E+01 SIGNIFICANCE OF F = SIGNIFICANT  
 R = +2.9091467E-01 SIGNIFICANCE OF R = SIGNIFICANT  
 I = +4.1245495E+00 SIGNIFICANCE OF I = SIGNIFICANT  
 N = 186 DEGREES OF FREEDOM = 184  
 STORAGE CONDITIONS = AMB TEMP/AM TEST CONDITIONS = 160 DEG F, AMB R

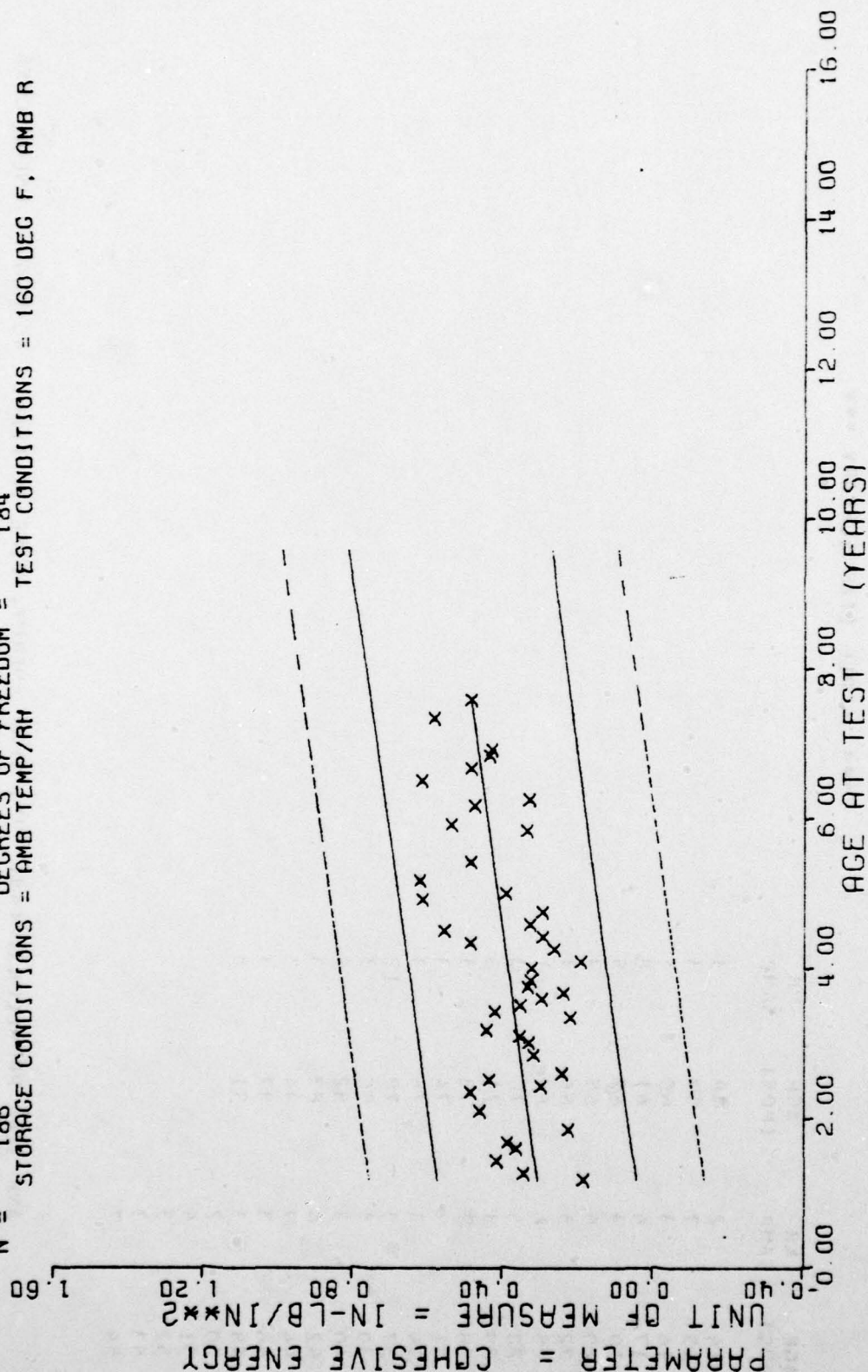


Figure 9-44

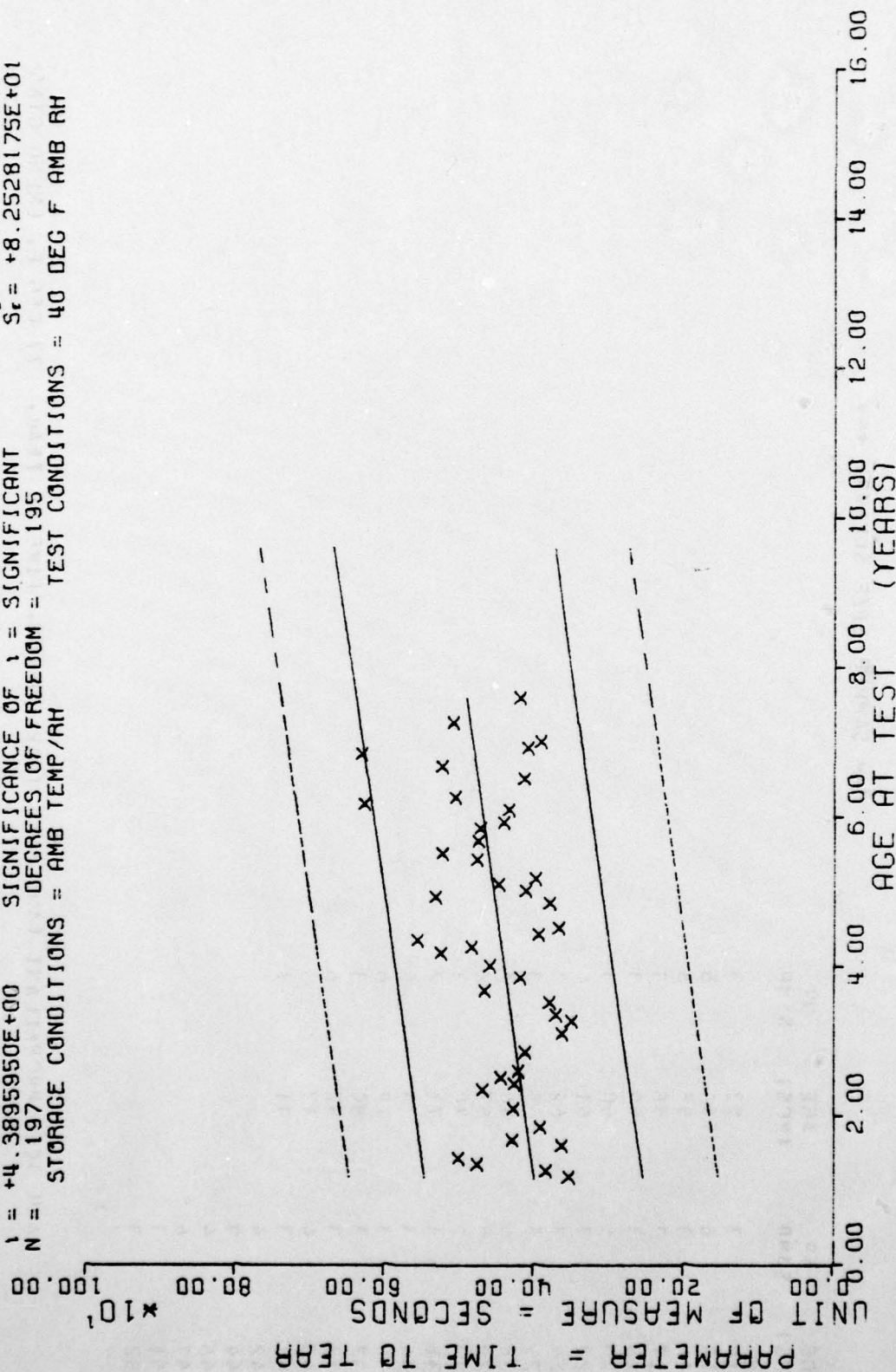
\*\*\* SAMPLE SIZE SUMMARY \*\*\*

AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP
14	2	58	3
15	7	59	3
16	3	60	3
17	4	61	3
19	3	62	5
20	6	65	9
22	3	66	3
25	6	68	1
28	6	70	3
29	3	71	3
30	3	73	3
31	3	74	3
34	3	75	3
37	3	78	12
39	3	80	3
40	3	82	9
42	6	83	3
44	9	84	3
46	3	87	3
48	3	91	3
50	2		
51	4		
52	3		
53	3		
54	7		

ANP 3066 PROPRIANT (ANT 00) TIAR ENERGY, TIME TO TEAR, 40 DEG F, UNLND CTAS



$f = +1.9268545E+01$   
 $R = +2.9987844E-01$   
 $i = +4.3895950E+00$   
 $N = 197$   
 $Y = (( +3.8393097E+02 ) + ( +1.1763171E+00 ) * X)$   
 SIGNIFICANCE OF F = SIGNIFICANT  
 SIGNIFICANCE OF R = SIGNIFICANT  
 SIGNIFICANCE OF i = SIGNIFICANT  
 DEGREES OF FREEDOM = 195  
 STORAGE CONDITIONS = AMB TEMP/AM  
 TEST CONDITIONS = 40 DEG F AMB RH

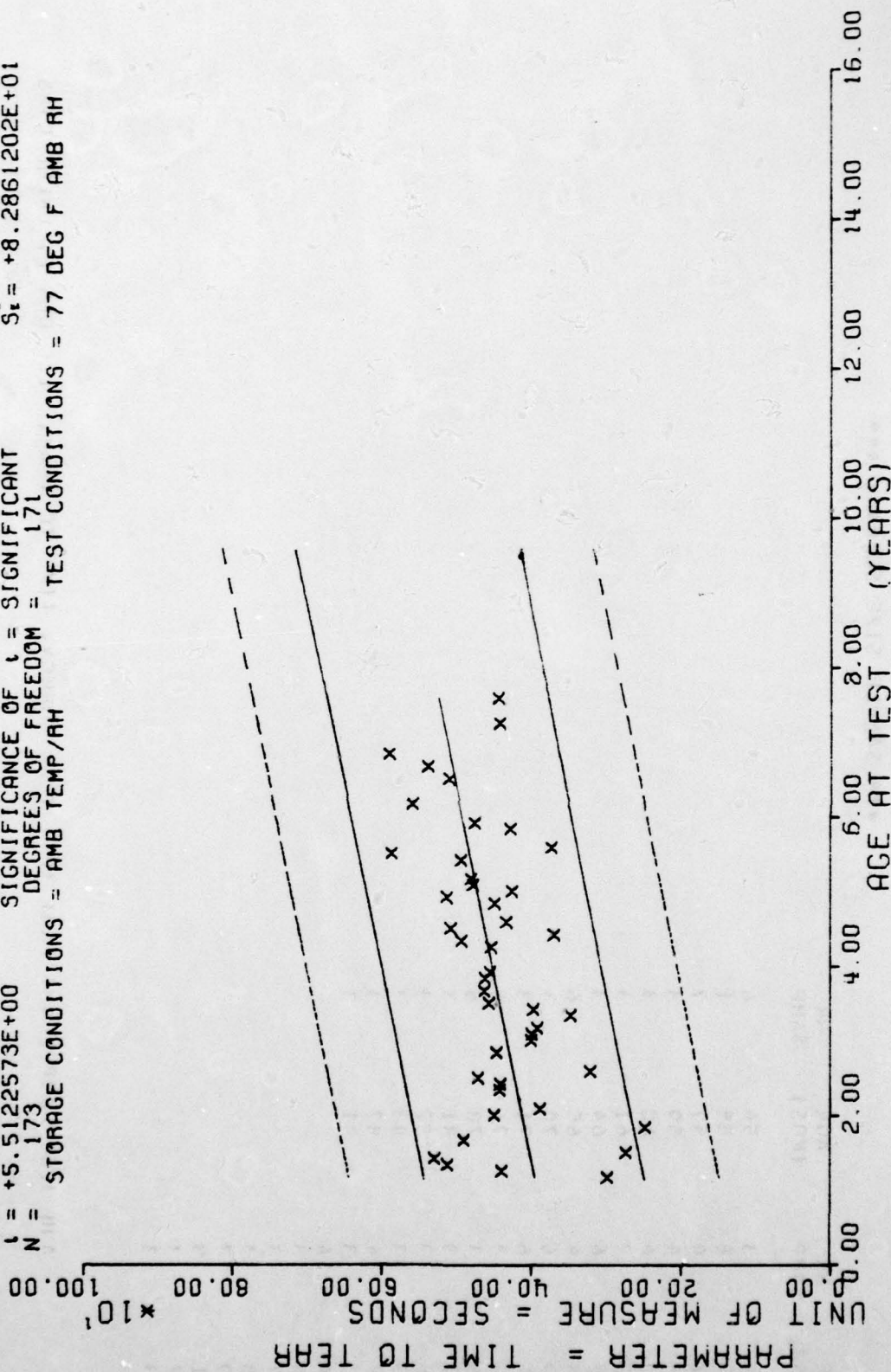


\*\*\* SAMPLE SIZE SUMMARY \*\*\*

AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP
14	3	53	3
15	6	54	6
16	3	55	3
17	3	56	3
18	3	59	3
20	4	60	3
22	3	61	6
24	3	62	3
25	3	65	3
28	6	66	3
29	5	67	2
30	2	70	3
31	3	71	2
34	3	74	6
36	3	78	6
37	3	80	3
38	3	82	6
40	4	87	3
41	3	91	3
42	4		
44	9		
46	4		
47	6		
51	3		
52	3		

AMB 3066 PROPELLANT (ANF 000) TEAR ENERGY, TIME TO TEAR, 77 DEG F, UNLND CINS

$Y = ((+3.7545952E+02) + (+1.6648207E+00) * X)$   
 $F = +3.0384980E+01$  SIGNIFICANCE OF F = SIGNIFICANT  $G_1 = +8.9660374E+01$   
 $R = +3.8843284E-01$  SIGNIFICANCE OF R = SIGNIFICANT  $S_1 = +3.0202160E-01$   
 $t = +5.5122573E+00$  SIGNIFICANCE OF t = SIGNIFICANT  $S_2 = +8.2861202E+01$   
 $N = 173$  DEGREES OF FREEDOM = 171  
 STORAGE CONDITIONS = AMB TEMP/AH TEST CONDITIONS = 77 DEG F AMB RH



ANB 3066 PROPELLANT (ANT 'P') TEAR ENERGY, TIME TO TEAR, 77 DEG F, UNLND CTNS

Figure 9-46



AD-A080 581

OGDEN AIR LOGISTICS CENTER HILL AFB UT PROPELLANT LAB--ETC F/6 21/9.2  
PROPELLANT SURVEILLANCE REPORT ANB-3066 PROPELLANT.(U)  
NOV 79 E M DALABA

UNCLASSIFIED

MANCP-417(79)

NL

5 OF 5

AD  
A080581



END

DATE  
FILMED

3-80

DDC



\*\*\* SAMPLE SIZE SUMMARY \*\*\*

AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP
14	3	54	6
15	6	55	1
17	4	57	7
18	4	59	3
20	6	60	3
22	3	61	3
25	6	64	3
28	4	65	6
29	6	70	3
31	6	71	3
34	3	74	6
36	3	78	6
37	3	81	3
38	3	82	3
40	3	83	3
42	4	87	3
43	3	91	3
44	14		
46	3		
47	3		
48	3		
49	3		
51	2		
52	3		
53	3		

AIR 3066 PROPELLANT (ANT 00) TEAR ENERGY, TIME TO TEAR, 120 DEG F, UNINC CTNS



$Y = ((+3.6584897E+02) + (+7.9091346E-01) \times X)$   
 $F = +1.0000009E+01$  SIGNIFICANCE OF F = SIGNIFICANT  
 $R = +2.3769145E-01$  SIGNIFICANCE OF R = SIGNIFICANT  
 $t = +3.1622792E+00$  SIGNIFICANCE OF t = SIGNIFICANT  
 $N = 169$  DEGREES OF FREEDOM = 167  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 120 DEG F AMB RH

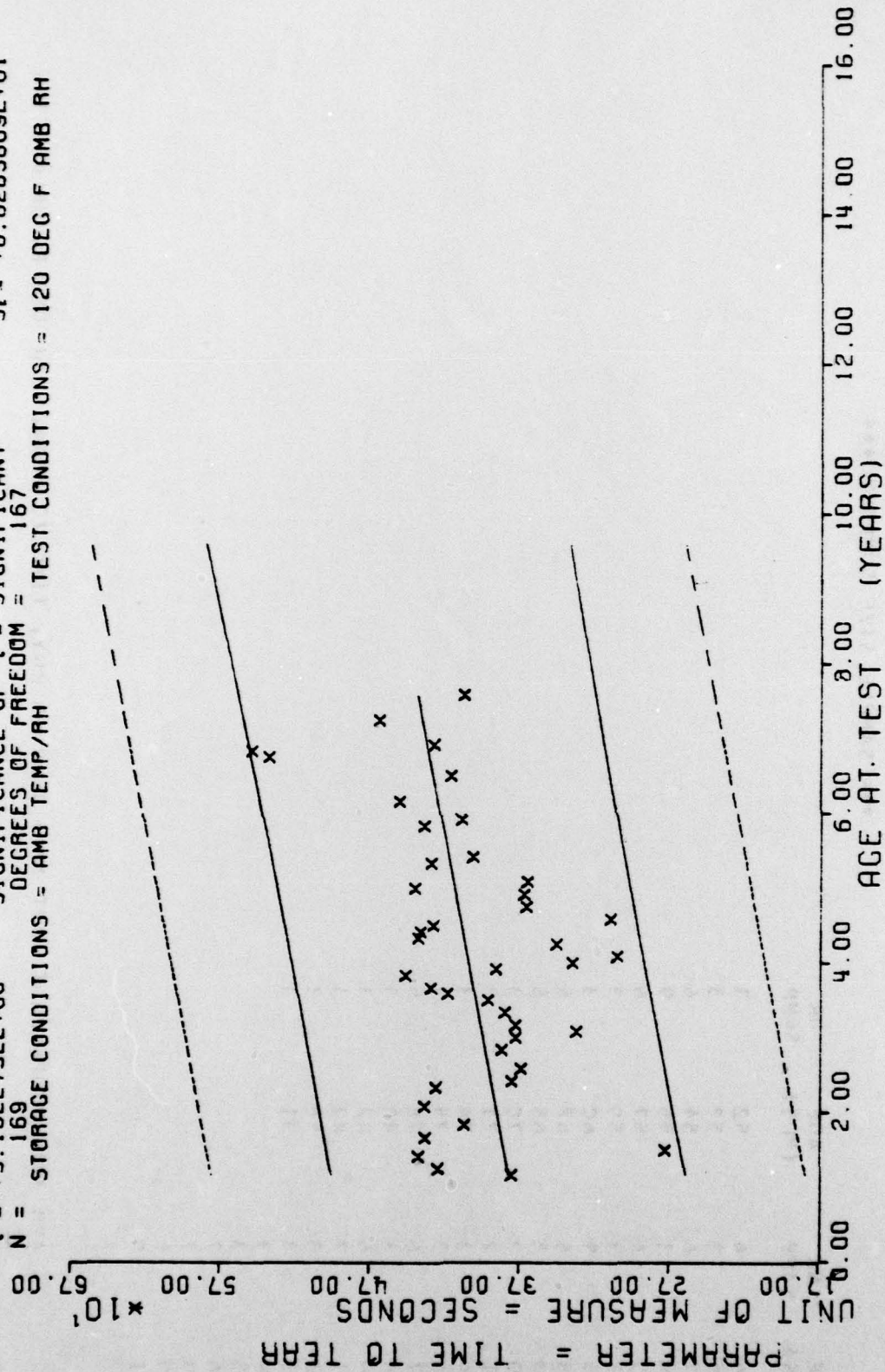


Figure 9-47

\*\*\* SAMPLE SIZE SUMMARY \*\*\*

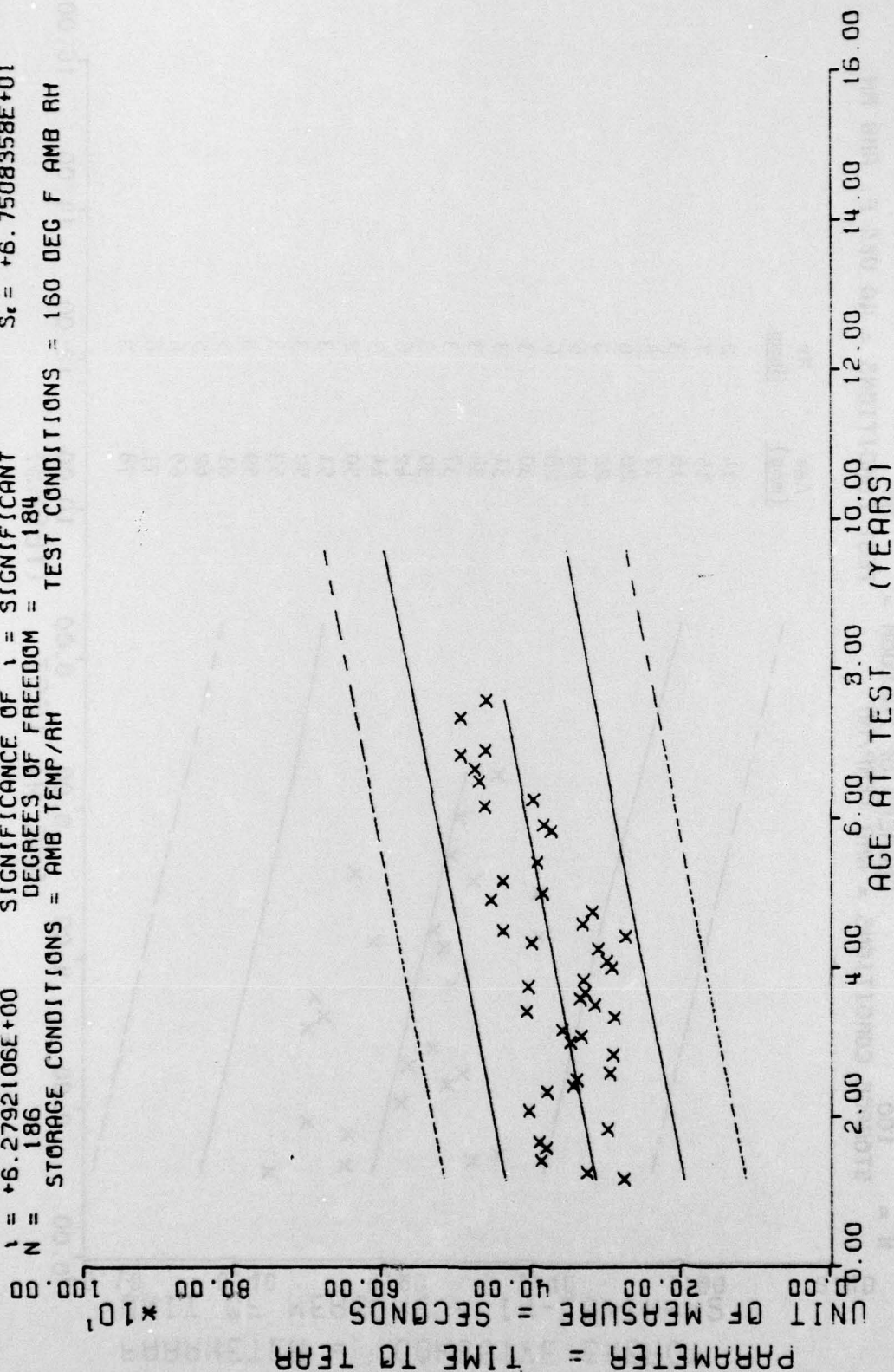
AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP
14	4	52	3
15	3	53	3
17	6	54	6
19	3	55	9
20	6	57	6
22	3	59	3
25	3	60	3
29	6	62	6
29	3	65	6
30	3	70	3
31	2	71	3
34	3	74	3
36	3	75	3
37	6	78	5
38	3	80	3
40	6	82	3
41	3	83	3
42	3	88	3
43	3	91	3
44	3		
45	3		
46	7		
48	3		
49	6		
51	9		

AND 1066 PROPHETIC (ANT. 0.1) TEAR ENERGY, TIME TO TEAR, 160 DEG F. UNLHD CTNS

THIS PAGE IS BEST QUALITY REPRODUCTION  
FROM COPY FORWARDED TO DIA



Y = (( +2.9358722E+02 ) + ( +1.5698425E+00 ) \* X)  
 F = +3.9428486E+01 SIGNIFICANCE OF F = SIGNIFICANT  
 R = +4.2008365E-01 SIGNIFICANCE OF R = SIGNIFICANT  
 I = +6.2792106E+00 SIGNIFICANCE OF I = SIGNIFICANT  
 N = 186 DEGREES OF FREEDOM = 184  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 160 DEG F AMB RH

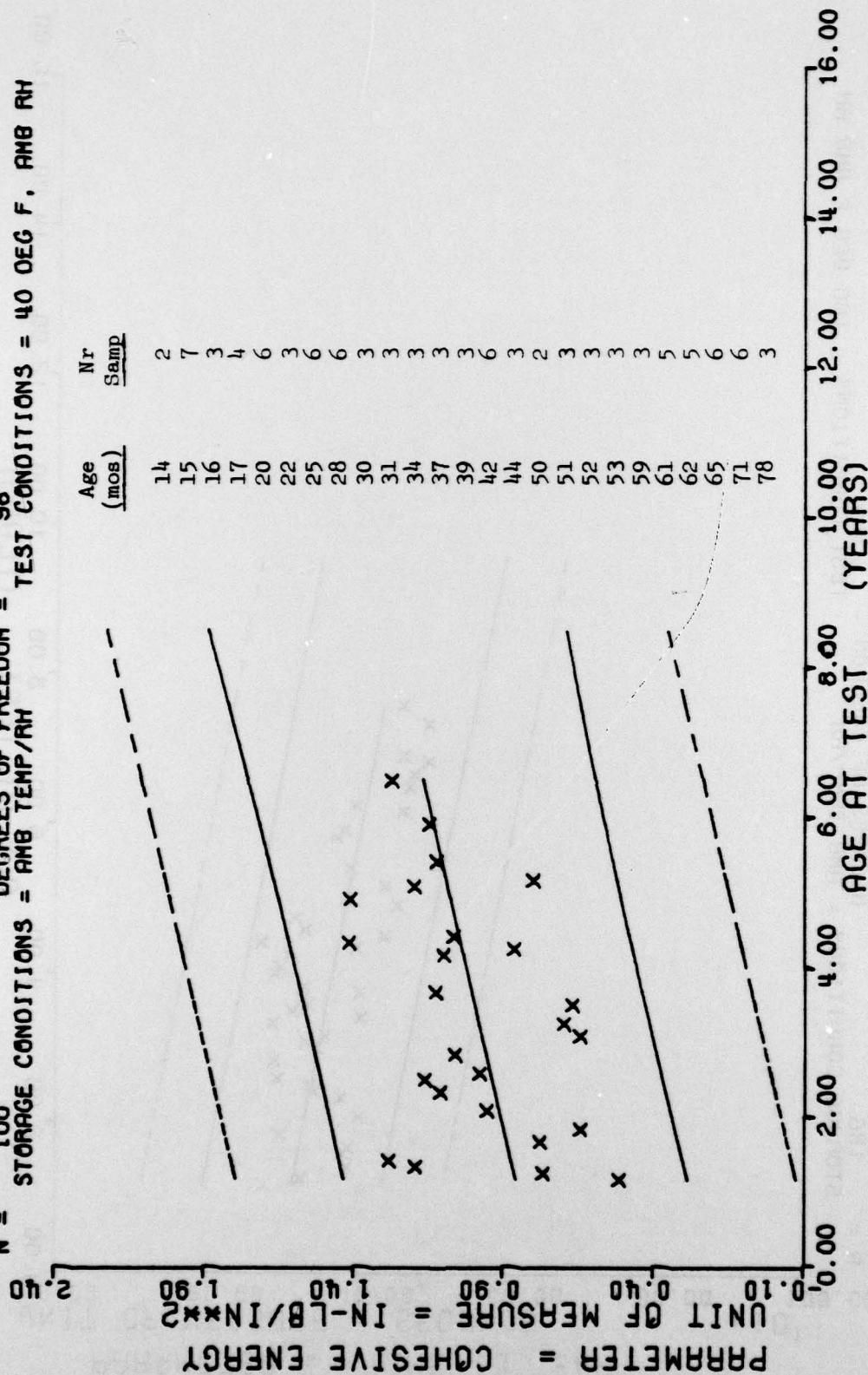


AMB 3066 PROPELLANT (ANT 'P') TEAR ENERGY, TIME TO TEAR, 160 DEG F, UNLND CTNS

Figure 9-48



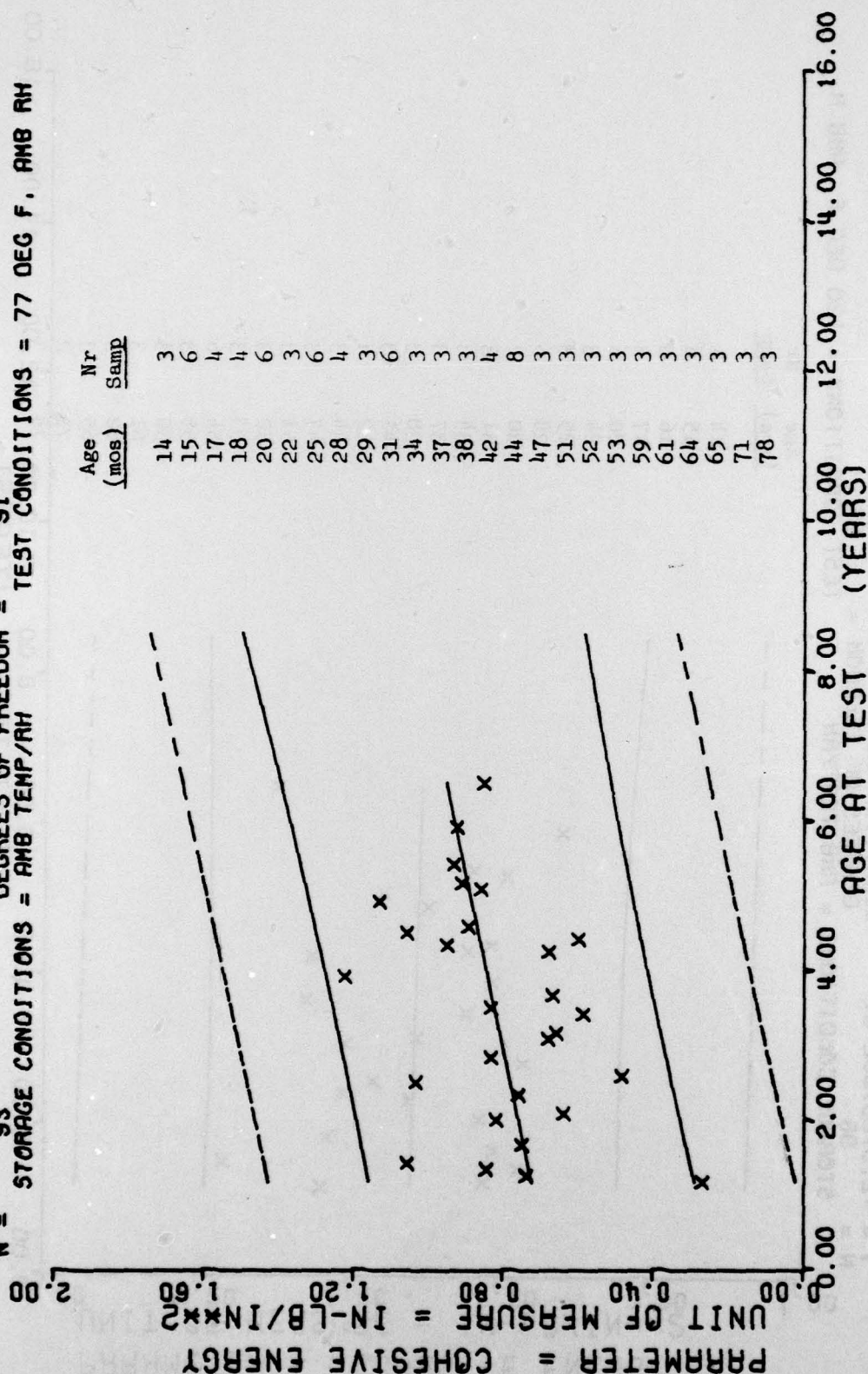
$Y = (1 + 7.9374818E-01) + (1 + 4.8259807E-03) \times X$   
 $F = +8.8396054E+00$  SIGNIFICANCE OF F = SIGNIFICANT  $G = +3.2405527E-01$   
 $R = +2.8764067E-01$  SIGNIFICANCE OF R = SIGNIFICANT  $S = +1.6231891E-03$   
 $t = +2.9731474E+00$  SIGNIFICANCE OF t = SIGNIFICANT  $S = +3.1193963E-01$   
 $N = 100$  DEGREES OF FREEDOM = 98  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 40 DEG F, AMB RH



AMB 3066 PROPELLANT (ANT 'P') TEAR ENERGY, COHESIVE ENERGY 40 DEG F LINED CTNS

Figure 9-49

$Y = ((+6.7650452E-01) + (+3.5258996E-03) \times X)$   
 $F = +6.4108493E+00$  SIGNIFICANCE OF F = SIGNIFICANT  $\alpha = +2.4138667E-01$   
 $R = +2.5853942E-01$  SIGNIFICANCE OF R = SIGNIFICANT  $S_e = +1.3925543E-03$   
 $t = +2.5319655E+00$  SIGNIFICANCE OF t = SIGNIFICANT  $S_t = +2.3458678E-01$   
 $N = 93$  DEGREES OF FREEDOM = 91  
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 77 DEG F, AMB RH



ANB 3066 PROPELLANT (ANT 'P') TEAR ENERGY, COHESIVE ENERGY 77 DEG F LINED CTNS

Figure 9-50



$Y = (1 + 4.8402962E-01) + (1 + 2.1936758E-04) * X$   
 $F = +6.6202208E-02$  SIGNIFICANCE OF F = NOT SIGNIFICANT  $\sigma = +1.4825268E-01$   
 $R = +2.6528911E-02$  SIGNIFICANCE OF R = NOT SIGNIFICANT  $S_e = +8.5258212E-04$   
 $t = +2.5729789E-01$  SIGNIFICANCE OF t = NOT SIGNIFICANT  $S_t = +1.4898671E-01$   
 $N = 96$  DEGREES OF FREEDOM = 94  
 STORAGE CONDITIONS = AMB TEMP/RY TEST CONDITIONS = 120 DEG F, AMB R

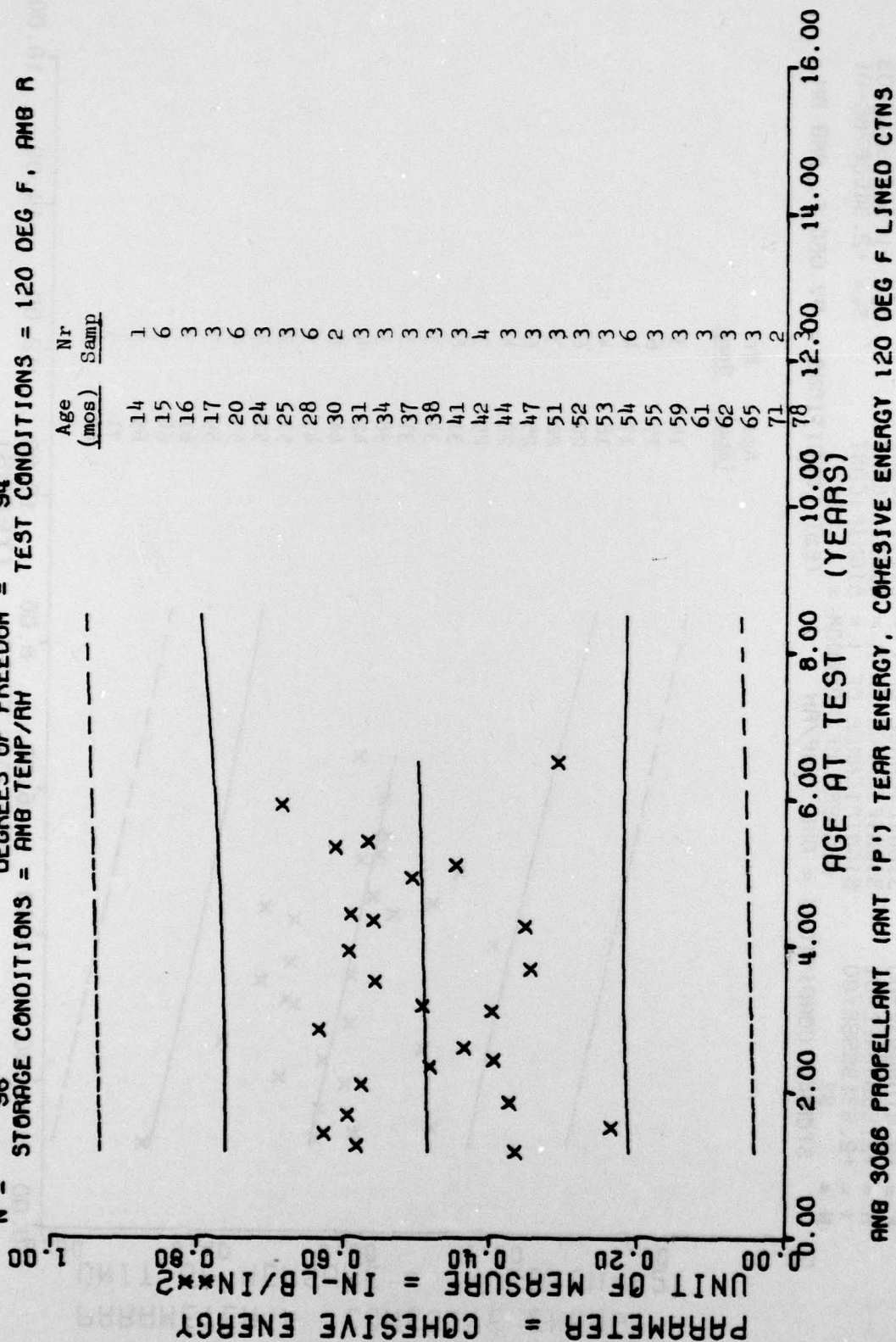
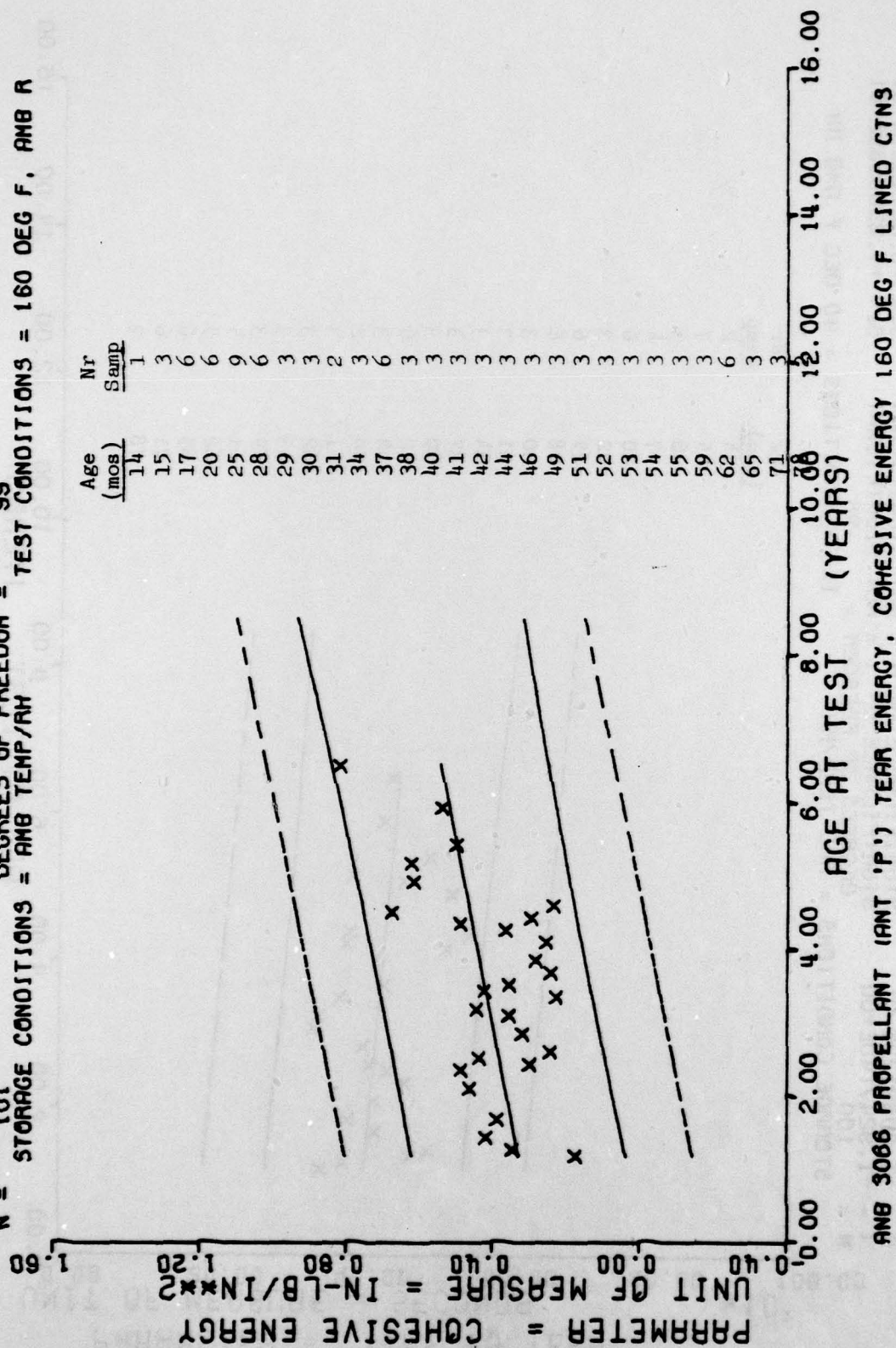


Figure 9-51



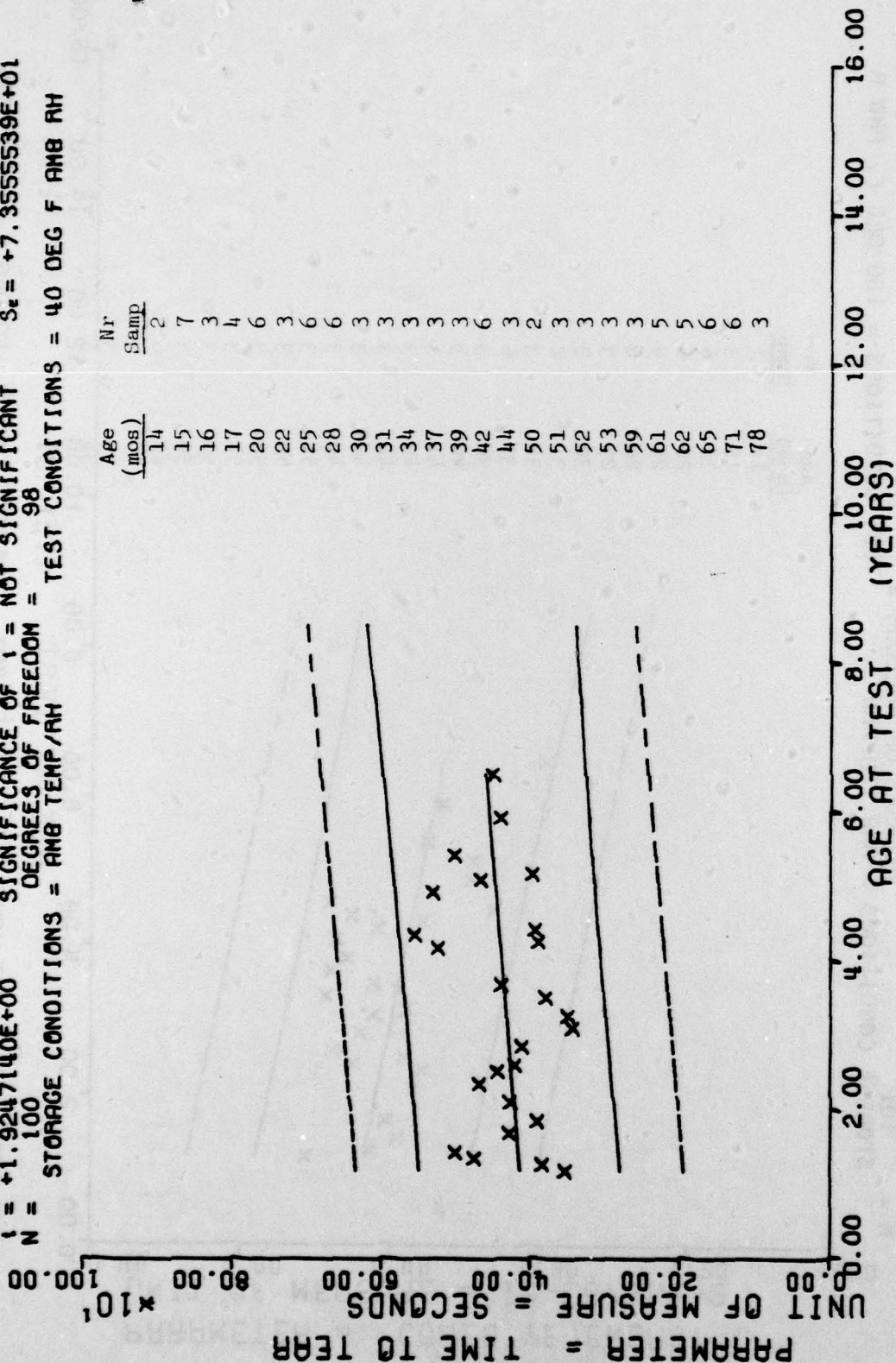
$Y = ((+2.8405137E-01) + (+3.3058618E-03) * X)$   
 $F = +1.1563582E+01$  SIGNIFICANCE OF F = SIGNIFICANT  
 $R = +3.2340010E-01$  SIGNIFICANCE OF R = SIGNIFICANT  
 $t = +3.4005268E+00$  SIGNIFICANCE OF t = SIGNIFICANT  
 $N = 101$  DEGREES OF FREEDOM = 99  
 STORAGE CONDITIONS = AMB TEMP/AMB TEST CONDITIONS = 160 DEG F, AMB R



ANB 3066 PROPELLANT (ANT 'P') TEAR ENERGY, COHESIVE ENERGY 160 DEG F LINED CTNS

Figure 9-52

$Y = ((+4.0425040E+02) + (+7.3668222E-01) \times X)$   
 $F = +3.7045242E+00$  SIGNIFICANCE OF F = NOT SIGNIFICANT  $\sigma_r = +7.4553480E+01$   
 $R = +1.9085172E-01$  SIGNIFICANCE OF R = NOT SIGNIFICANT  $S_e = +3.8274891E-01$   
 $t = +1.9247140E+00$  SIGNIFICANCE OF t = NOT SIGNIFICANT  $S_e = +7.3555539E+01$   
 $N = 100$  DEGREES OF FREEDOM = 98  
 STORAGE CONDITIONS = AMB TEMP/AH TEST CONDITIONS = 40 DEG F AMB RH



AMB 3066 PROPELLANT (ANT 'P') TEAR ENERGY, TIME TO TEAR, 40 DEG F, LINED CTNS

Figure 9-53



$Y = (1 + 4.2974166E+02) + (+6.2175583E-01) * X$   
 $F = +2.2086614E+00$  SIGNIFICANCE OF  $F =$  NOT SIGNIFICANT  $G = +7.0938320E+01$   
 $R = +1.5393466E-01$  SIGNIFICANCE OF  $R =$  NOT SIGNIFICANT  $S = +4.1836495E-01$   
 $I = +1.4861565E+00$  SIGNIFICANCE OF  $I =$  NOT SIGNIFICANT  $S = +7.0476881E+01$   
 $N = 93$  DEGREES OF FREEDOM = 91  
 STORAGE CONDITIONS = AMB TEMP/AM TEST CONDITIONS = 77 DEG F AMB RH

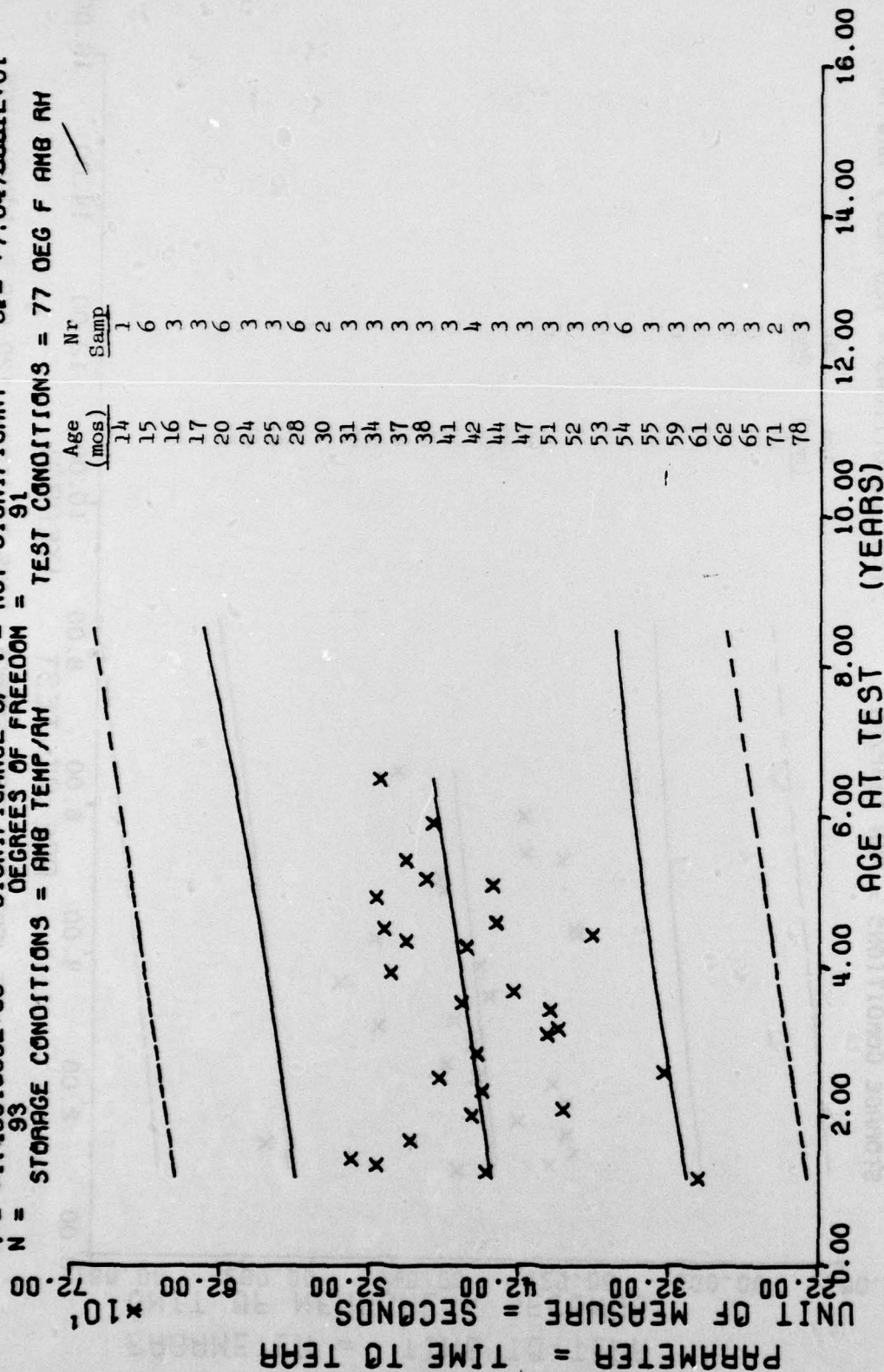


Figure 9-54



Y = (( +4.0018269E+02 ) + ( -3.9325523E-01 ) \* X )  
 F = +1.3273091E+00 SIGNIFICANCE OF F = NOT SIGNIFICANT  $G_1 = +5.9751203E+01$   
 R = -1.1799874E-01 SIGNIFICANCE OF R = NOT SIGNIFICANT  $S_1 = +3.4134100E-01$   
 t = +1.1520890E+00 SIGNIFICANCE OF t = NOT SIGNIFICANT  $S_2 = +5.9648536E+01$   
 N = 96 DEGREES OF FREEDOM = 94

STORAGE CONDITIONS = AMB TEMP/AH TEST CONDITIONS = 120 DEG F AMB RH

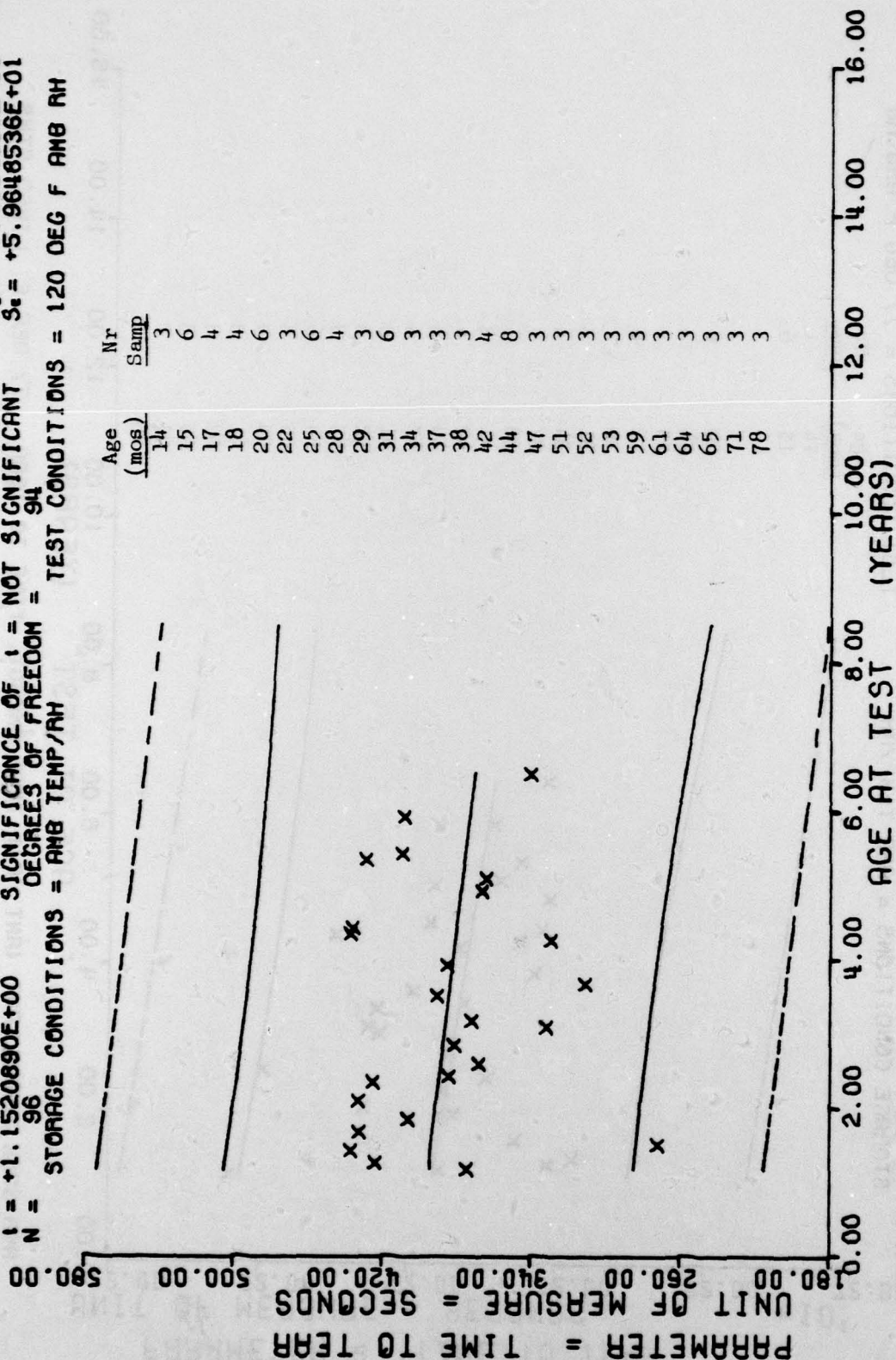
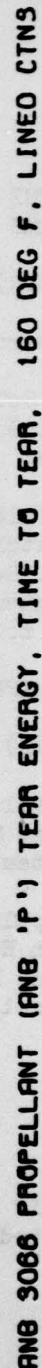


Figure 9-55

$$Y = -71.49 + 9.76X_1 + 0.21X_2 + (-9.8536435E-01) * X_3$$


9 - 82



# DISTRIBUTION

## NR COPIES

OO-ALC	
MMWRME	1
MMWRMS	1
DDC (TISIR) Cameron Station, Alexandria, VA 22314	2
AFPRO, Aerojet, Sacramento, CA 95813	1
Aerojet Solid Propulsion Company	2
P.O. Box 15847, Sacramento, CA 95813	
Attn: Mr. D.D. Woodman	
AFPRO, Thiokol Chemical Corporation	2
Wasatch Division	
P.O. Box 524	
Brigham City, UT 84302	
(Cy to Larry Hales)	
AFRPL (MKPB) Edwards AFB, CA 93523	1
SAC (LGMB) Offutt AFB, NB 68113	1
U.S. Naval Ordnance Station, Indian Head, MD 20640	1
Fleet Support Dept., Propulsion	
System Development Division, Code FS7	
CPIA, Applied Physics Laboratory	1
John Hopkins University	
Johns Hopkins Road	
Laurel, MD 20810	

NOTE: If this report is no longer desired or a new individual is interested, please notify OO-ALC/MMWRME Hill AFB, UT 84056